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Mine Emergency Operations of the Mining Enforcement and Safety Administration



UNITED STATES DEPARTMENT OF THE INTERIOR

Mining Enforcement and Safety Administration

Washington, D. C. 20240

Mine Emergency Operations of the Mining Enforcement and Safety Administration

By Donald P. Schlick, Office of the Assistant Administrator,
Technical Support, Arlington, Va.



UNITED STATES DEPARTMENT OF THE INTERIOR

Rogers C. B. Morton, Secretary

Mining Enforcement and Safety Administration

James M. Day, Administrator

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MINE EMERGENCY OPERATIONS OF THE MINING ENFORCEMENT AND SAFETY ADMINISTRATION

by

Donald P. Schlick¹

INTRODUCTION

At about 5:15 a.m., on November 20, 1968, near Farmington, W. Va., a coal mine explosion occurred in the Consol No. 9 mine of Consolidation Coal Co., while 99 men were underground on the midnight to 8 a.m. shift. In the ensuing hours and days, 21 men escaped, but 78 miners were entombed somewhere in the mine when it was finally sealed on November 30, 1968.

This disaster brought to the forefront of public opinion, the issues of mine health and safety and culminated in the enactment of the Federal Coal Mine Health and Safety Act of 1969.

Quickly sensing the urgent need for action to develop much more sophisticated and effective mine survival and rescue techniques, the then Director of the Bureau of Mines, John F. O'Leary, sent a letter to the President of the National Academy of Engineering on December 3, 1968, inviting the Academy to participate in a study to determine how miners prospects of survival might be improved in the event of any circumstance that precluded their normal withdrawal from a mine.

The President of the Academy accepted the challenge and on February 25, 1969, submitted a proposal for a study directed toward an assessment of the technological capabilities that may be applied to survival techniques in mining disasters.

The Bureau of Mines response was favorable and punctual, with Contract No. S0190606 (Appendix A) being approved by both parties by March 5, 1969. The final report of the Academy, which was released in March 1970, recommended that the Bureau move immediately to:

1. Develop a self-contained escape breathing apparatus which provides oxygen for one hour and is as portable as present technology permits.
2. Investigate the feasibility of installing portable and central shelters within mines by developing and testing prototype portable shelters

¹Assistant Administrator--Technical Support.

able to withstand secondary explosions and containing life support for 15 men for 15 days.

3. Develop and acquire an electromagnetic communication system capable of voice transmission to the mine and coded message transmission to the surface.

4. Develop and acquire a seismic system capable of locating a trapped miner who has no means of communication except by pounding on the mine roof, rib, or floor.

5. Acquire two drilling rigs capable of high penetration rates to depths of 2,500 feet; one rig to probe for trapped miners with 6- to 8-inch holes; the other to cut 28-inch holes for rescue.

These recommendations served as a starting point for a continuing and concentrated effort by the Department of the Interior to improve its mine search and rescue capability following entrapment of miners.

ORGANIZATION OF MINE EMERGENCY OPERATIONS GROUP

To assure that the most sophisticated and effective mine survival and rescue techniques were made available promptly, in line with the recommendations of the National Academy of Engineering, the Deputy Director, Health and Safety, Bureau of Mines was given major responsibility for developing a comprehensive mine search and rescue plan of procedure with resources and capabilities to locate miners trapped in a mine disaster, establish communications, and effect their survival and eventual rescue through boreholes drilled from the surface. Upon completing the plan in 1971, he set up a Mine Emergency Operations Group (MEO) in the Pittsburgh Technical Support Center to operate it, which included acquiring, manning, and maintaining the necessary equipment and facilities.

It would be well to advise at this point that prior to 1973, administration of the Federal Coal Mine Health and Safety Act of 1969 and the Federal Metal and Nonmetal Mine Safety Act was the responsibility of the Bureau of Mines. On May 7, 1973, a new organizational unit within the Department of the Interior, the Mining Enforcement and Safety Administration (MESA), was established by Secretarial Order and, upon becoming operative on July 16, 1973, assumed the majority of responsibilities involving administration of the two Acts. Overall administration of the Mine Emergency Plan then became the responsibility of the Assistant Administrator, Technical Support, MESA.

Authority to expend Federal funds for conducting mine emergency operations in all mines is found in the Organic Act of the Bureau of Mines, as amended, and in Sections 103, 501, and 502 of the Federal Coal Mine Health and Safety Act of 1969, with the specific provisions being:

Sec 103(e).--"...in the event of any accident occurring in a coal mine where rescue and recovery work is necessary, the Secretary or an authorized representative of the Secretary shall take whatever action he deems appropriate to protect the life of any person, and he may, if he deems it appropriate, supervise and direct the rescue and recovery activity in such mine."

Sec. 501(a).--"The Secretary...shall conduct such studies, research, experiments, and demonstrations as may be appropriate--

(2) to develop new or improved methods of recovering persons in a coal mine after an accident;

(3) to develop new or improved means and methods of communication from the surface to the underground area of a coal mine."

(11) for such other purposes as...necessary to carry out the purpose of this Act."

Sec. 501(c).--"In carrying out the provisions for research, demonstrations, experiments, studies, training, and education under this section...the Secretary...may enter into contracts with and make grants to, public and private agencies and organizations and individuals..."

Sec. 502(b).--"The Secretary shall, to the greatest extent possible, provide technical assistance to operators in meeting the requirements of this Act and in further improving the health and safety conditions and practices in coal mines."

Inasmuch as suitable personnel, equipment, and facilities required by the plan were not all available in the Bureau of Mines, those needed were obtained through contract with private industry.

In June 1970 a contract (No. B)101260) was awarded to the Westinghouse Electric Corporation's Space and Defense Center, Baltimore, Maryland, to undertake the five tasks previously delineated by the National Academy of Engineering. Although work is continuing on recommendation 1 through 3, the seismic and drilling equipment were delivered as operational in June 1971. Since 1971 the operation and maintenance function as well as emergency response capability has been contracted annually both with Westinghouse Electric Corporation and Rowan Drilling Company (a subcontractor to Westinghouse on the initial contract). Additionally, original equipment has been modified and upgraded, new equipment has been obtained and/or developed, and all equipment has been and is periodically field tested. Components consist of Communication/Location and Support Operations Equipment and Facilities operated by Westinghouse Electric Corporation, Rescue Drilling Equipment operated by Rowan Drilling Company, and Instrumented Hole Probes operated by the MEO Group and the Industrial Hazards and Communication Group, Bureau of Mines Mining and Safety Research Center at Pittsburgh.

The Organizational Chart of MESA's Mine Emergency Operation Group is shown in figure 1 and descriptions of the functions of the various units depicted therein are recorded in some detail in the pages of relevant material that follow.

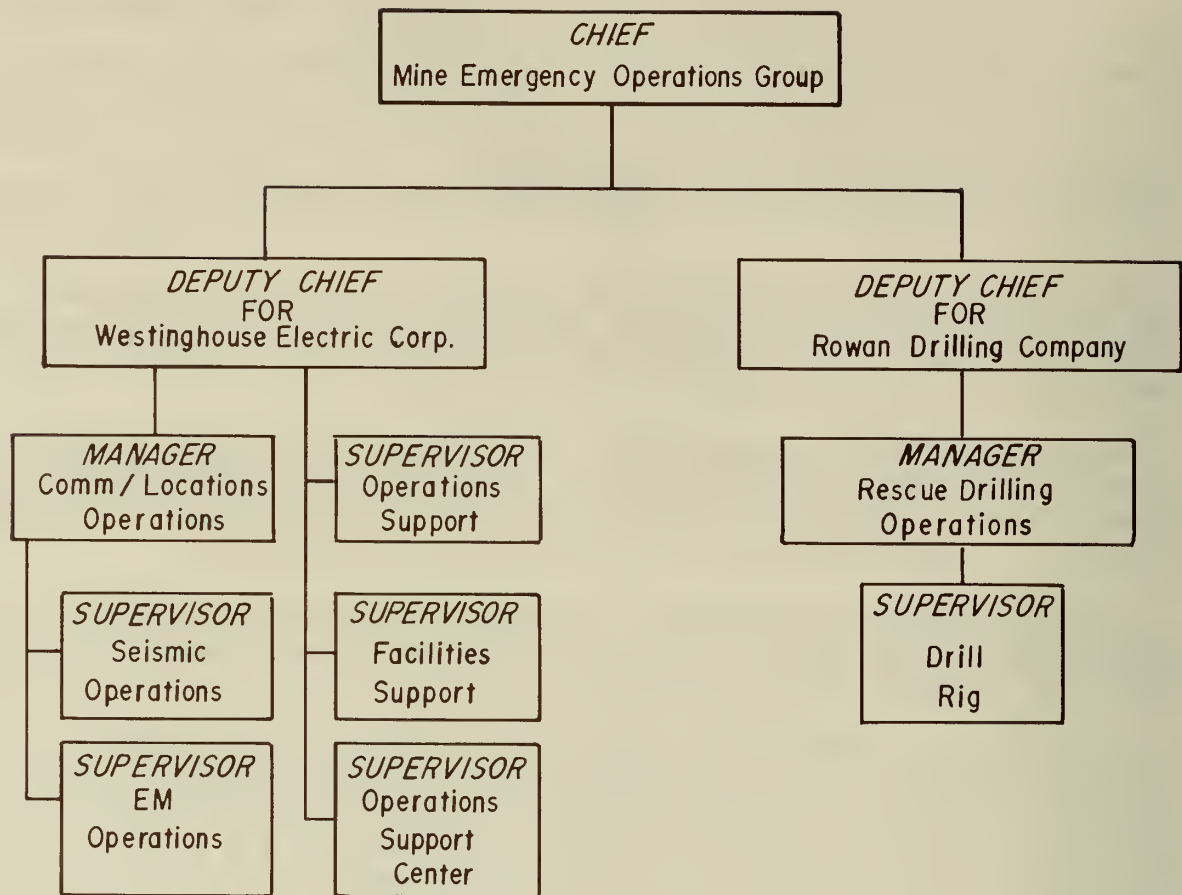


FIGURE 1. - Organization chart of MESA's Mine Emergency Operations Group.

Chief, Mine Emergency Operations Group

The responsibility for maintenance of equipment and facilities and for operation of the plan is delegated to the Chief, MEO Group, Pittsburgh Technical Support Center, who is functionally responsible to the Assistant Administrator, Technical Support, Washington, D.C. Primary responsibilities include the following:

1. Maintaining the MESA rescue drill rigs, communications (including seismic) equipment, and services in readiness for rapid mobilization.
2. Mobilizing and deploying the MEO Group personnel, equipment, and services to the emergency site when the decision for their use has been made.
3. Upon arrival at the mine site, conferring with the senior on-site MESA Health and Safety official and the mine operator to determine requirements for surface operations and specific locations for seismic survey and probe hole if appropriate.

4. Implementing and coordinating all on-site MEO Group rescue operations.
5. Providing additional technical and logistic support as required for rescue and recovery operations and accident investigations.

Deputy Chief (Westinghouse)

The Program Manager, Westinghouse Mine Emergency Operations Project, is designated Deputy Chief, Mine Emergency Operations, for Westinghouse Electric Corporation's participation under the plan, and he assists the Chief, Mine Emergency Operations Group as directed.

Communications/Location Operations

The Manager, Communication/Location Operations reports to the Westinghouse Deputy for direction, and is responsible for establishing a through-the-ground communications capability and determining the location of trapped miners.

Supervisor, Electromagnetic (EM) Communication Operations

The Supervisor, EM Communication Operations reports to the Manager, Communication/Location Operations. At the emergency site, he is responsible for the operation and maintenance of the through-the-ground EM communications equipment.

Supervisor, Seismic Operations

The Supervisor, Seismic Location Operations reports to the Manager, Communication/Location Operations. At the emergency site, he is responsible for the operation and maintenance of the seismic location equipment.

Deputy Chief (Rowan)

The Program Manager, Rowan Mine Emergency Operations Project is designated Deputy Chief, Mine Emergency Operations, for Rowan Drilling Company's participation under the plan, and he assists the Chief, Mine Emergency Operations Group as directed.

Rescue Drilling Operations

The Manager, Rescue Drilling Operations reports to the Rowan Deputy for direction, and is responsible for drilling search and rescue holes.

Supervisor, Drill Rig

The Supervisor, Drill Rig reports to the Manager, Rescue Drilling Operations. At the emergency site, he is responsible for the operation and maintenance of the drilling rig and the escape capsule.

Operations Support

The Westinghouse Deputy Chief is responsible for all activities in support of the Mine Emergency Operations equipment, and he additionally provides coordination between the various subcontractor/vendors and the equipment supported.

Supervisor, Operations Support

The Supervisor, Operations Support reports to the Westinghouse Deputy. At the emergency site, he is responsible for providing or acquiring support in the following functional areas:

1. Coordination of staging facility operations.
2. Selection and operation of equipment marshaling areas.
3. Access road and ground clearing operations at the emergency site.
4. Operation, maintenance, and service of heavy equipment, such as bulldozers, cranes, fork lifts, etc.
5. Direction of surveyors, explosives handlers, welders, and similar hired labor, not otherwise under the direct supervision of other system managers.
6. Physical arrangement of the vans and support equipment at the emergency site, except that drilling equipment and accessories will be off-loaded and positioned as directed by the Manager, Rescue Drilling Operations or the Chief, Mine Emergency Operations Group.
7. Surface communications, including radios, television equipments, land-line telephones, and public telephones. Maintain a record of formal communications and record the progress of rescue and recovery operations.

Supervisor, Facilities Support

The Supervisor, Facilities Support reports to the Westinghouse Deputy. At the emergency site, he is responsible for providing or acquiring support for the plan in the following functional areas:

1. Logistic subsystem support at the emergency site, such as locate and procure labor, equipment, and services required to support the plan.
2. Local transportation for personnel at the emergency site.
3. Administrative services, such as clerical and financial support, liability claim processing, maintenance of time and cost records for local labor and hired equipment, and provision for security services.
4. Supply support, such as issue and receipt and inventory control of support equipment, consumable stores, and material.

Supervisor, Operations Support Center

The Supervisor, Operations Support Center reports to the Westinghouse Deputy, and is responsible for providing or acquiring support in the following functional areas:

1. Notification of MEO personnel and vendors when various conditions are implemented under the plan.
2. Provision of pre-arranged contract support services and equipment to the emergency site.
3. Movement of equipment between the staging facility and the emergency site.
4. Arrange for initial personnel support and services, such as travel arrangements to and from the emergency site and housing accommodations off-site.
5. Provide support to the MEO field operations as required.

MEO Group--Personnel

Personnel with full-time assignments to the MEO Group include the Chief of the Group, MESA engineer and his Westinghouse Deputy, Westinghouse engineers and technicians, and drilling systems specialists with Rowan Drilling Co. These personnel are normally located and occupied as follows:

1. Technical Support Center at Pittsburgh, Pa.--Chief, MEO Group.
2. MEO Support Center near Baltimore, Md.--Westinghouse Deputy to the Chief, MEO Group, plus engineering personnel with experience in MEO Group mine rescue operations.
3. MEO Staging Facilities at Charleston, W. Va., and Salt Lake City, Utah. At each facility, Westinghouse engineers/technicians plus one Rowan drilling systems specialist. At the Charleston facility only, one Westinghouse electronics specialist for maintaining the seismic/EM communications equipment.

During mine emergency operations these personnel become the key members of the MEO organization, supporting the rescue effort. They are augmented as necessary with personnel possessing appropriate expertise.

EQUIPMENT AND SUPPORT FACILITIES

Knowledge of the equipment comprising the Mine Search and Rescue Plan, along with the associated support facilities, is essential to understanding the plan which includes communication/location equipment, surface drilling equipment, and instrumented borehole probes. The communication/location equipment which provides for electromagnetic through-the-earth communications

and the location of trapped miners by seismic techniques, is maintained and operated by Westinghouse Electric Corporation personnel during emergency deployments. The surface drilling equipment consists of two drilling rigs, each capable of drilling either probe holes or rescue holes, and is operated by Rowan Drilling Company personnel. Instrumented borehole probes provide for determining in-mine environmental conditions, down-hole communications, and remote scanning of in-mine conditions.

The support facilities used in conjunction with emergency deployments are at the Operations Support Center near Baltimore, Maryland, with equipment Staging Facilities at Charleston, W. Va., and Salt Lake City, Utah. Figure 2 shows the operations board at the Baltimore Mine Emergency Operations Center.

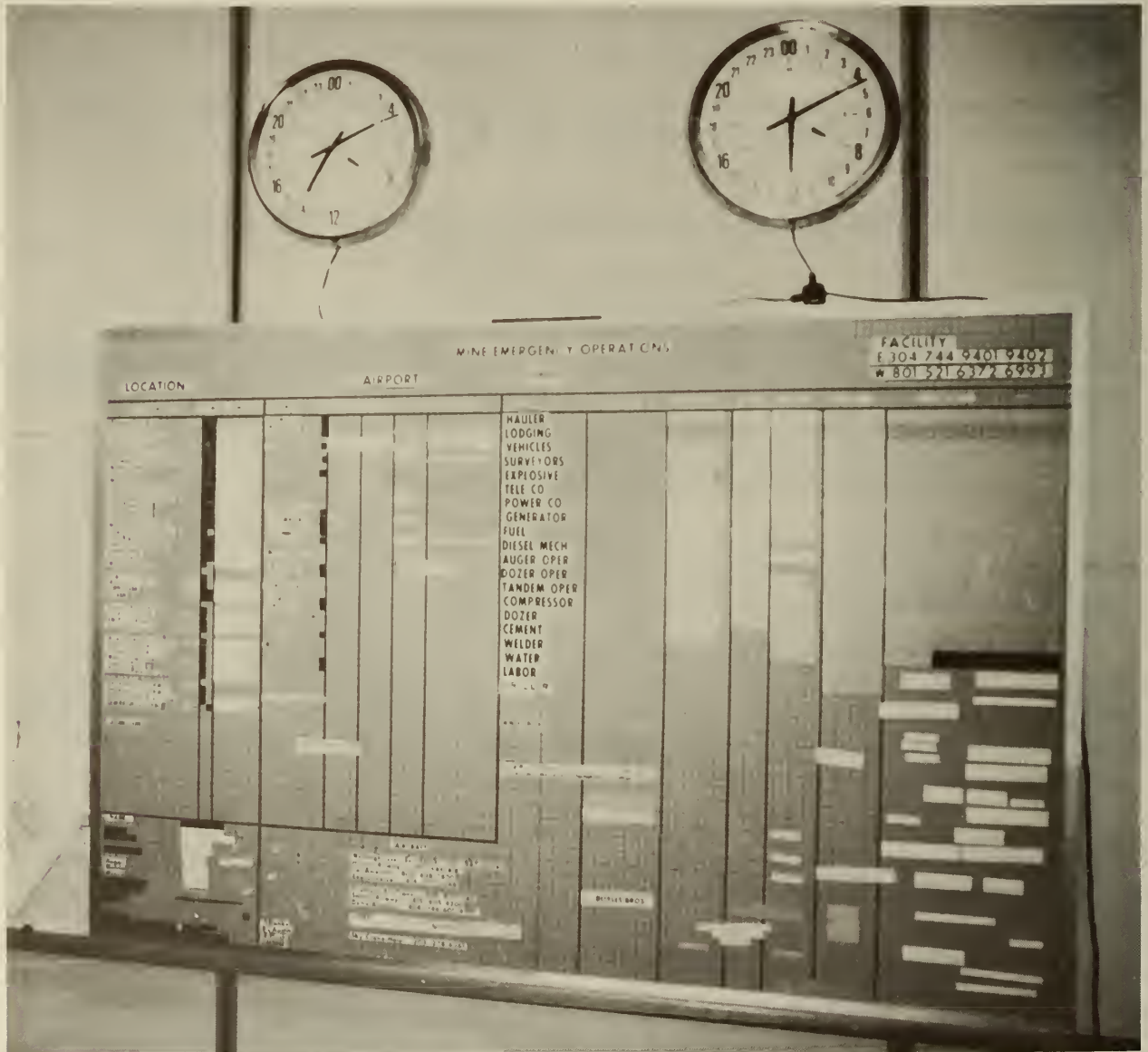


FIGURE 2. - Operations Board, Baltimore Mine Emergency Operations Center.

The detailed inventory of equipment housed at each of the staging facilities may change from day to day, however, each facility maintains a comprehensive, current list of available equipment and supplies.

Mine Search and Rescue Support Equipment

Seismic Location Equipment

The seismic location equipment is intended to detect and locate the source of seismic vibrations produced by trapped miners. (Seismic signal processing equipment is shown in fig. 3.) Suitable seismic signals can be generated by a miner striking with a hammer, timber, rail section, etc., the mine walls, rails, floor, or anything else in the mine that adequately couples the energy to the earth. The seismic equipment consists of four to seven geophone arrays deployed on the surface over possible areas of entrapment with each array containing up to seven geophones. The area covered by the arrays is approximately one-half mile in diameter. Cables and/or radiotelemetry links connect each geophone array to a signal processor located in the seismic system equipment van. The geometric computations required to convert the relative arrival times of seismic signals at each geophone into position coordinates is performed by either an on-location computer, or by a larger remote computer which is accessed through a telephone link.

Several items that are required to support the operation of the seismic location equipment are detailed in the Manual of Operating and Maintenance Instructions for Seismic Equipment² and in Appendix B. Surveying equipment, maintained with the seismic system, is required to determine the relative position of each geophone. When the location of the seismic signal source has been computed, further surveying in conjunction with mine maps, etc., is required to establish the proper surface or subsurface location for drilling operations.

The equipment is housed in a Porta-Kamp on a tilt bed truck, both of which can be transported by cargo aircraft having a minimum cargo capability of a C-130 type aircraft.

Electromagnetic Communication Equipment (EM)

The electromagnetic communication equipment provides through-the-earth radio transmission of voice or beacon messages. Personnel in the mine may be equipped with a miniature receiver capable of detecting electromagnetic, voice radio transmissions from the surface. This receiver is no larger than a transistor radio, and has an ear plug for listening. Personnel in the mine may also be equipped with a small, 4-watt beacon transmitter. The operator can select one of six coded beacon signals to be automatically transmitted or may operate the beacon manually, as in Morse code. Further details are contained in the Manual of Operating and Maintenance Instructions for Subsurface Communications Equipment.³

²On file at MEO Center at Baltimore, Charleston, and Salt Lake City.

³Work cited in footnote 2.



FIGURE 3. - Seismic signal processing equipment.

This equipment may presently be used only for communication between surface and underground rescue teams. However, underground receiver and beacon transmitter units may be issued to miners at some future date as a part of their survival equipment.

The equipment is housed in a Porta-Kamp on a tilt bed truck, both of which can be transported by cargo aircraft having the minimum cargo capability of a C-130 type aircraft.

Drilling Rig

Either drill rig with associated support equipment is capable of drilling probe and rescue holes. However, they will be used for probe drilling only when other probe drills cannot be obtained. Figure 4 shows a typical drill



FIGURE 4. - Typical drill rig and ancillary equipment.

rig and ancillary equipment. The probe hole will accommodate communication, supply, and medical capsules to establish communication with and provide temporary relief for trapped miners. The rescue hole (approximately 28-1/2 inches in diameter) will accommodate a metal escape capsule in which trapped miners or victims can be hoisted to the surface. Further specifications are contained in Appendix C and in the Manual of Operation and Maintenance Instructions--Rescue Subsystem Equipment.⁴

Borehole Probes

MESA has two communications probes and the Industrial Hazard and Communications Group, Bureau of Mines Mining and Safety Research Center, has three probes. (Figure 5 shows a communications/gas sampling probe.)

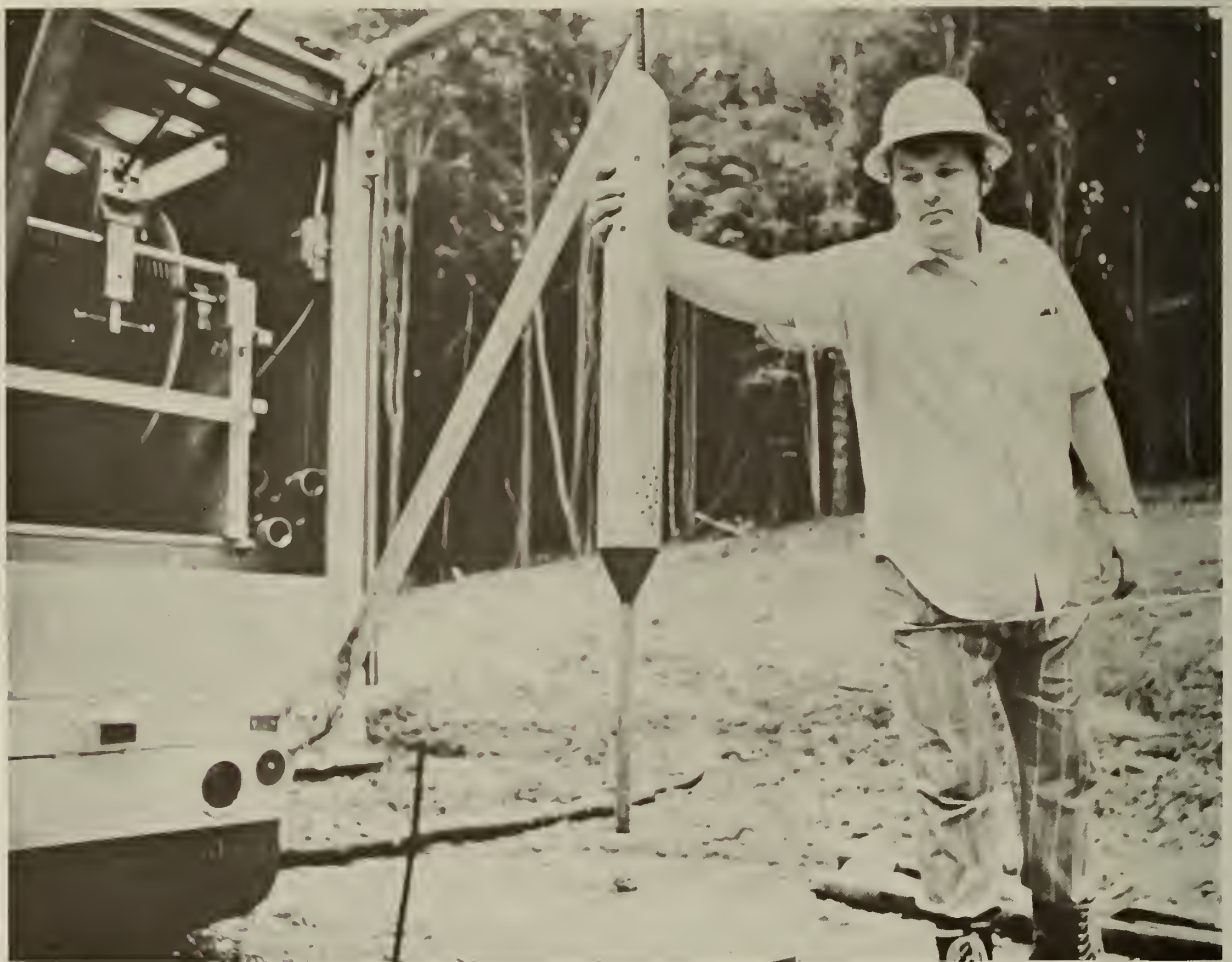


FIGURE 5. - Communications/gas sampling probe.

⁴ See work cited in footnote 2.

In combination they provide the following capabilities:

1. Two-way intercommunications.
2. Sensitive microphone-amplifier for listening.
3. Flashing light.
4. Air temperature and infrared thermometers.
5. Tubing for withdrawing gas samples.
6. TV camera with image intensifier for low light levels and light source.

The probes are relatively small, and are readily transportable. Specially designed electric/hydraulic winches with special cables have been provided for lowering the probes. The Industrial Hazard and Communications Group has probe handling equipment and monitoring facilities mounted on a 4-wheel drive truck which can be airlifted if required. The probes are also compatible with the Schlumberger⁵ well logging cable and equipment which will be used for borehole probe operations when available.

Borehole probes do require certain surface equipment which includes the following:

1. Rotators with controls for scanning 360 degrees with thermometers and TV camera.
2. Surface readouts for thermometers and intercom amplifier with headsets.
3. Vacuum pump and portable chromatograph for gas sampling.
4. TV monitor with circuits for monitoring in the c/c van.

Leased Drilling Equipment

Pre-emergency arrangements have been made with drilling contractors at key locations throughout the country for the lease of drill equipment for both surface and in-mine rescue operations.

Supply Van

The supply van is a truck-towed trailer which stocks about 200 spare line items as well as equipment and materials, such as special and foul weather clothing, tools, wire, hose, pipe and plumbing fittings, electrical hardware,

⁵Schlumberger well logging services, which are known and distributed throughout the United States, are used in subsurface logging of oil and gas exploration and production drill holes.

communications spares, and many others. The van also contains the stock accounting for all the MEO equipment so that up-to-date on-site accountability can be maintained. It may be used as a communications/control center.

The supply van is self-sufficient, containing two bunks, a washbasin with water supply, toilet facilities, heat and air conditioning, and a work bench, and is accompanied by a 23 KW diesel generator trailer for on-site power.

Communications/Control (C/C) Van

The c/c van is a large, camper-type vehicle specially equipped to function as the MESA communications and control center for on-site rescue operations. Under the current MEO operational concept, a c/c van and/or supply van can be dispatched to the site of a mine emergency whenever needed.

Physical features of the c/c van include:

1. Sleeping accommodations for up to six persons.
2. Conference space for groups up to seven persons.
3. Stove, refrigerator, air conditioner, commode, washbasin and shower with self-contained water supply.
4. Auxiliary 6.5 KW Onan⁶ generator fueled from the van's gasoline supply.

The special functional equipment which has been installed in the van includes:

Land-line Communications

The c/c van is equipped with two 2-line telephones. One of these, provided for the conference table, contains a speaker-amplifier attachment for conference use. The other, located at the communications console, includes an answering and recording device for recording two-way conversations. With this phone, the communicator/record-keeper can maintain an audible log whenever there is not sufficient time for written records.

Sound-powered and battery-powered field telephone lines may be connected to the van via an external junction box.

Radio Communications

Radio facilities include the following:

- a. A 45-watt radio-telephone transceiver. One unit is located inside the van and a similar unit is provided for location at a public telephone, if

⁶Reference to specific makes of equipment is made for identification only and does not imply endorsement by the Mining Enforcement and Safety Administration.

such a link is desired. Also available is a portable radio-relay transceiver for use in the event that the integrity of the radio-telephone link is impaired by terrain or distance. The radio-telephone in the van may be operated from the communications console or from a telephone hand set at the conference table.

b. A 5-watt radio transceiver. This equipment operates on any Citizen Band (CB) frequency, and on government emergency frequencies of 27.575 and 27.585 KHz. Other transceiver units are located in the supply van, the seismic van, and the Drill Unit office. Additional units, stored in the supply van, can be utilized at other locations, such as the mine rescue operations center, and carried by field personnel.

c. A 25-watt transceiver, which operates on the 49.61 MHz scene-of-action frequency assigned to MESA, is the primary on-site net for communicating with the supply van and the seismic van.

Television Monitoring and Recording

The MEO rescue equipment includes sub-miniature and low light level television cameras, one of which is built into one of the borehole probes. A portable television monitor is provided for use as required at the scene of activity and, in addition, a twin-screen monitor is installed in the communications console in the c/c van. Capabilities of this monitor include a "continuous" time-lapse video tape recorder which affords uninterrupted recording of video for 12 hours on a single 7-inch reel. A second recorder, in parallel with the first, is capable of "selective" operation, permitting instant replay, stop-action, and slow-motion playback of selected sequences without interfering with the continuous recording by the other recorder. The twin-screen monitor can produce displays of each of the two recorders simultaneously. Another feature of the monitor system permits the viewer to choose inputs to the selective recorder from any one of a maximum of five camera inputs. The monitor and both recorders are removable from the console for operation outside the van if desired.

Support Facilities

Mine Emergency Operations Support Center

The MEO Support Center is located in the Westinghouse Defense and Electronics Systems Center, adjacent to the Friendship Airport near Baltimore. The office contains seven telephone terminals, the Center's files, and status boards. It is the routine working area for the Baltimore members of the Mine Emergency Operations Group.

During a mine emergency the Center is manned on a 24 hour-a-day basis by two to three members of the MEO Group whose function is to provide logistics and administrative support to the MEO activities.

The files at the Center contain information which is pertinent to the movement and support of the MEO Group and equipment, including:

1. State road maps for every State, including preferred routes.
2. County maps of every county in every State containing underground mines.
3. Topographic maps of mining areas in West Virginia and other selected areas.
4. Air and rail transportation routes, including points of contact for special transportation arrangements and airfields capable of supporting air movement of the MEO equipment.
5. State highway load, height and weight limitations, and procedures for obtaining emergency overload permits for all States.
6. Points of contact for State highway department routing advice and police department escort in all States.
7. Various other information as gleaned from past emergencies and field tests.

The files also contain information pertaining to the movement and support of MEO personnel, such as:

1. Scheduled airlines, charter airlines, and route information, including procedures for preferred reservations for advance rescue party personnel.
2. Information concerning housing and local transportation.

Lists of vendors and contractors in key locations in the vicinity of underground mining areas are maintained for acquisition of essential equipment and operational support. These lists are supplemented by numerous informal agreements with selected contractors throughout the country. In addition, telephone directories of over 100 key cities in underground mining areas have been obtained. Contractors and services contained in the lists include the following:

1. Surveyors
2. Explosives contractors
3. Welders
4. Compressors
5. Pumps
6. Earth movers

7. Augers
8. Drilling contractors
9. Drilling supplies
10. Rental vehicles
11. Water trucks
12. Field sanitation facilities
13. Field food and berthing facilities
14. Generators
15. Casing and pipe
16. Cranes
17. Commercial truckers

Status boards showing the status of all MEO personnel and equipment are posted in the MEO Support Center, and are maintained current for immediate emergency use. During mine emergencies these status boards also show field operation conditions and progress.

Mine Emergency Operations Staging Facilities

All MEO equipment, except the instrumented borehole probes, is stored and maintained in two staging facilities located at Charleston, W. Va., and Salt Lake City, Utah. These facilities are warehouse type structures operated for MESA by the Westinghouse Electric Corporation.

Characteristics of individual sites are as follows:

Eastern Facility at Charleston, W. Va.

This facility is part of a large industrial complex known as the Charleston Ordnance Center. The location affords ready access to major highways and the Charleston airport and it is served by an active rail spur. Security and telephone answering service is provided by roving guards during week nights and by a resident guard during weekends and holidays.

Equipment housed at this facility includes:

- a. Drilling unit with approximately 26 skid loads of supporting equipment and material.
- b. Mobile seismic communications and locating unit, including two van trucks, an 8-inch mobile auger, and a diesel generator trailer.

- c. Mobile EM communications van.
- d. Large mobile auger for starting rescue holes.
- e. D-6 dozer with lowboy.
- f. Tandem truck with gin-pole.
- g. Mobile communications/control (c/c) van for on-site MESA operations center.
- h. Supply van trailer with separate diesel generator trailer.
- i. Diesel air compressor for use with drilling unit.

Western Facility at Salt Lake City, Utah

This facility is part of the Mark Steel Corporation complex in the southwest quadrant of the city with ready access to trunk highways, the Salt Lake City airport, and the major rail terminal in the city.

Equipment housed at this facility includes:

- a. Drilling unit with approximately 19 skid loads of supporting equipment and material.
- b. C/C van,
- c. Supply van trailer with separate diesel generator trailer.

OPERATIONS

This part describes the sequence of events that may be expected to occur under the plan in a mine emergency operation. Conditions encountered will dictate changes in the operating procedure as the operation progresses, and the ability to vary the operating procedure is essential to effective performance of the rescue mission.

Condition of Readiness

Three conditions of readiness (ready, alert, and deploy) have been established to describe the MEO Group posture and the activities to be undertaken in response to a mine emergency.

Ready Condition

The everyday working condition of men and equipment associated with the Mine Search and Rescue Plan is the ready condition. Both men and equipment are ready and available to deploy at any time.

Mine Emergency Operations Personnel

Designated members of the Mine Emergency Operations Group maintain a capability, 24 hours per day, to respond to emergency calls. In addition, members are given such training and accomplish such tasks as are necessary to enhance the capabilities of the Mine Search and Rescue Plan. Each member, through his work in the ready condition, contributes toward the successful result of the deployed Mine Emergency Operations equipment.

Operations Support Center

The Westinghouse Operations Support Center, Baltimore, is used as office space for the completion of tasks in support of the MEO. This area is manned during normal working hours only and contains information useful during a mine emergency operation.

Equipment Status

Equipment associated with MEO is maintained in a state of readiness at the staging facilities at Charleston, W. Va., and Salt Lake City, Utah. For short periods of time, certain components may be out of commission due to maintenance and modification as new concepts are adopted. In addition, items of equipment may be in the field undergoing field test and analysis. Information concerning the location and status of equipment is maintained in the Operations Support Center, and the Chief, Mine Emergency Operations, is informed of all changes of location or status.

Notification Plan

Each Deputy Chief insures the preparation and maintenance of an emergency notification plan for his respective personnel. Each plan contains as a minimum the name, address, and the office and home telephone number of each member of the Mine Emergency Operations Group. The Rowan Deputy provides the Westinghouse Deputy with two or more points of contact in the Rowan plan. The Westinghouse plan includes these Rowan points of contact.

The Westinghouse Deputy provides the Chief, Mine Emergency Operations Group, with the name, address, and the office and home telephone numbers of two or more points of contact within the Westinghouse plan.

Alert Condition

The alert condition is that period of time between receipt of an alert and the receipt of an order to terminate the alert, or to deploy the equipment and support personnel. Activation sequence of the MEO Group may be summarized as follows:

1. The mine operator notified the MESA Health and Safety District Manager or Subdistrict Manager of certain accidents in metal/nonmetal mines and in coal mines respectively as specified in Parts 58 and 80, title 30 Code of Federal Regulations.

2. Upon receiving notification of an accident in any of the specified categories, the District/Subdistrict Manager immediately relays the information by the most expeditious means available to the appropriate Assistant Administrator at Washington, D.C., who is responsible for rescue and recovery operations and accident investigations. If he determines that the accident involves possible entrapment of men or a potential requirement for MESA services or equipment he immediately notifies the Assistant Administrator, Technical Support, who after consultation with and approval by the Administrator, MESA, orders the Chief, MEO, to mobilize, alert, or deploy personnel and equipment.

3. Normally, the alert or deploy conditions are transmitted by the Chief, MEO Group to his Westinghouse Deputy who initiates the MEO Emergency Notification Plan. Subsequent operations proceed in accordance with the MEO Plan and with specific directions of the Chief, MEO Group.

4. In urgent situations or in the event that the Assistant Administrator--Technical Support does not immediately establish contact with the Chief, MEO Group, the Westinghouse Deputy or his designated representative may be notified directly by one of several specified MESA officials to initiate the Emergency Notification Plan and proceed with rescue operations as directed.

Mine Emergency Operations Personnel

When the alert condition is set, the MEO Notification Plan is initiated. The MEO Support Center at Baltimore will be manned continuously until further notice and the Staging Facilities will be manned on a 24-hour basis until otherwise directed. Other MEO personnel are instructed to remain at respective locations and await further instructions or proceed to designated locations and prepare for immediate deployment.

Mine Emergency Operations Support Center at Baltimore

Personnel manning the Center accomplish the following actions:

1. Insure the completion of the Notification Plans and the commencement of all Center logs and status boards.
2. Determine optimum personnel travel methods and routes and make preliminary arrangements for travel, lodging, and local transportation at the emergency site for use in the event that deployment is directed. Identify personnel supporting vendors in the emergency area and alert them as to the possible need for their services.
3. Identify equipment supporting vendors in the emergency area and alert them as to the possible need for such services.

It is essential that the efforts described above be accomplished rapidly and thoroughly in reaching an alert condition. Therefore, a minimum listing of man-tasks to be performed by Center personnel is set forth in Appendix D.

The Supervisor, Operation Support Center, keeps the Chief, MEO Group, informed of the progress in achieving a full alert condition.

It is emphasized that while the alert condition does not require automatic movement of any equipment, the following actions may be taken or directed by the Chief, MEO Group:

The Chief, MEO Group, and two Westinghouse personnel proceed to the emergency site by the most expeditious means (obtained by the MEO Support Center).

The communications/control (c/c) van proceeds from the nearest staging facility to the emergency site.

If it is initially determined that an entrapment has occurred, the alert condition will be bypassed and the deploy condition will be initiated immediately.

Deploy Condition

The deploy condition is normally initiated in the same manner as the alert condition. Notifications in accordance with the MEO Notification Plan include specific instructions for initial movements of designated personnel and equipment. Early actions which can occur when the deploy condition is set include:

1. The MEO Center and staging facilities are manned on a 24-hour basis.
2. The Chief, MEO Group, the Westinghouse Deputy and Supervisor, Operations Support, proceed to the emergency site by the most expeditious means.
3. The c/c van proceeds from the nearest staging facility to the emergency site.
4. The seismic trucks, the supply van, and operating personnel may be directed to proceed immediately to the emergency site.
5. Cognizant Bureau of Mines personnel are alerted for possible use of probe hole instruments.
6. As the Chief, MEO Group, appraises the emergency situation enroute to the site he may direct deployment of other support equipment.
7. Upon arrival at the mine site, the Chief, MEO, reports to the senior Health and Safety Officer at the scene. They, with the mine operator, determine the requirements for surface operations, direct location of the seismic survey, and designate operating areas for MEO equipment.
8. Deploy the rescue drill rig to a location near the mine site.

9. If field tests using required equipment are in progress, the equipment will be disengaged from such tests and diverted to the mine site.

10. Other support activities are determined by progress and events during the emergency operations.

Once established, the deploy condition continues until formally terminated by direction from an authorized MESA official to cease emergency action and/or vacate the site of the mine emergency.

Deployment

Three levels of deployment are postulated for planning purposes. They are additive in that level II includes level I, and level III includes levels I and II. These levels of deployment, which are intended to provide degrees of response to meet the varying requirements at mine emergencies with effective and timely MEO support, are set forth below. Personnel manning levels are contained in table 1.

Level I--The MEO Notification Plan is executed and the operations support center and the staging facilities are manned. The c/c van is moved to the emergency site while the Chief, MEO Group, proceeds there, accompanied by the Westinghouse Deputy and Supervisor, Operations Support.

Level II--In addition to the above, the supply van, seismic van, auxiliary van, and diesel generator tractor are deployed to the site. If a probe hole is drilled, the probe equipment and operating personnel are deployed to the site. If the mine emergency is in the western area, the seismic van and personnel are flown to the closest suitable airport near the emergency site. The rescue drilling equipment may be deployed to a nearby marshalling area. The Rowan Deputy proceeds to the mine site.

Level III--In addition to the above, the rescue drill unit, support equipment, and drillers are deployed to the site.

A level II or III deployment effort will be ordered whenever personnel are known to be trapped in a mine.

Movement

Upon deciding to utilize the MEO equipment, movement to the emergency site commences.

If not already deployed, the Supervisor, Operations Support, proceeds to the emergency area immediately and determines the actions necessary to prepare the selected site(s) for MEO equipment operations and to establish surface communications. If required, he locates a suitable marshaling area for the rescue drilling equipment, and advises the MEO Chief and appropriate staging facility as to its location.

For eastern emergencies, movement of MEO equipment from the eastern facility normally is via highway. The c/c van and the seismic equipment are driven to the site by personnel from the staging facility. Other equipment is transported by a trucking vendor.

For western emergencies, movement of MEO equipment from the western facility normally is via highway. The c/c van is driven to the site by staging facility personnel. The seismic unit and operating personnel normally are airlifted from Charleston, W. Va., to an airfield close to the emergency site. The unit is then driven to the site by the operating personnel. Other equipment is transported by a trucking vendor.

Other support personnel, materials and supplies, including the instrumented borehole probes, are transported to the site via the most expeditious means available.

When the rescue drilling equipment is deployed, the Rowan Deputy contacts the appropriate staging facility and the Operations Support Center and verifies the sequence of movement. As directed, the equipment is transported directly to the mine site or to a marshaling area where it is off-loaded and placed in standby status. Trucks and trailers necessary to effect movement to the mine site will be ready at the marshaling area.

The Supervisor, Operations Support Center, takes action to insure that MEO equipment, support personnel, and vendor support are expeditiously deployed to the emergency site and/or designated locations.

Site Preparation

Once the operating areas for MEO equipment have been designated, land surveyors, either from the mine or from local contractors, are assigned to provide tie-in between the mine configuration and surface topography. General considerations in site preparation for the major MEO equipment are as follows:

Seismic Equipment Siting

The seismic unit is positioned generally over a known or suspected area of entrapment which should be fairly level and accessible. Some road preparation may be needed to facilitate access to the site, however, the unit may be transported to a site by tracked vehicle or helicopter. It is not necessary for the van or its equipments to be positioned directly over a signal source, since equipment operating distances will accommodate some horizontal displacement. Cable and radiotelemetry links between the seismic sensors and the van allow wide latitude in the placement of geophone arrays relative to the location of the van. The electric power supply for the van is mounted on a rubber-tired vehicle or trailer to provide seismic isolation. Neither this generator nor the van should be sited in the immediate vicinity of a geophone subarray as interference with signal reception may result from personnel activity or equipment noises transmitted through the earth to the sensors.

Rescue Drilling Equipment Siting

The preferred general layout for operating the drill rig is shown in figure 6. A clear, relatively flat area, approximately 70 x 100 feet, accessible by roads capable of supporting heavy equipment, is desired for the rescue drilling site. However, some latitude in site selection is possible since equipment layout configurations are somewhat flexible. For instance, pipe bin locations can be shifted (say 90° clockwise in figure 6) when dictated by terrain characteristics. Such a configuration is not optimum, however, and will impose delays in making up pipe joints and thereby degrading system performance. Extra care would also be required to prevent accidents to the driller or other men working on the drill floor when bringing in pipe from the side of the rig.

Some site clearance and/or access road preparation may be necessary, although such activities should be held to a minimum to save time. The center of the drill floor should be directly over the point where the hole is to enter the mine. However, considerable latitude is permitted in selection of a drilling point if the area of entrapment is extensive.

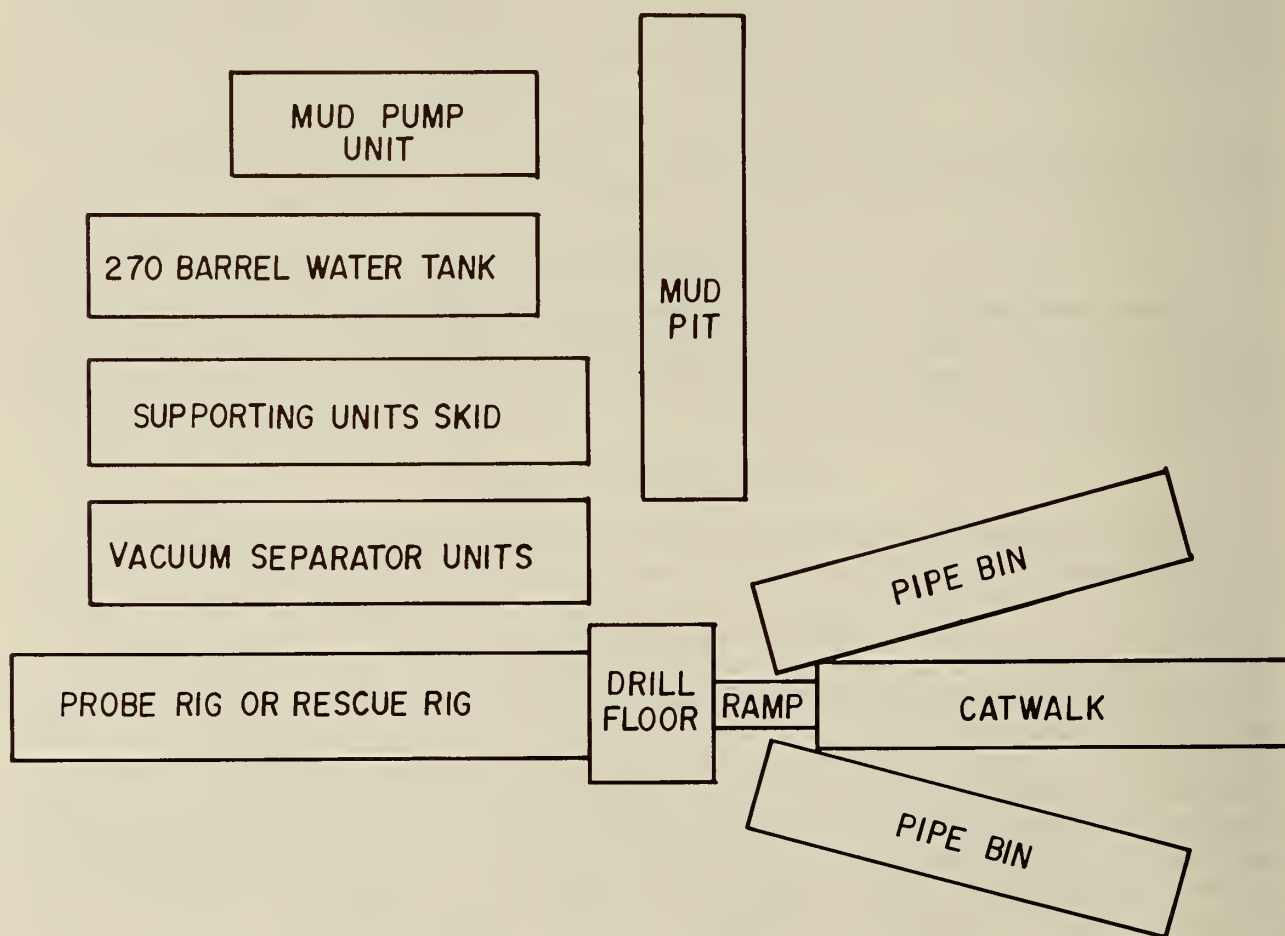


FIGURE 6. - Drill rig preferred layout.

The basic drill rigs may be configured to operate with a variety of circulation media and modes including direct air, vacuum, reverse air, and water. The choice depends on local conditions, such as expected flow from the surface water table and differing geological formations.

Surface Communications

A radio network is established for the coordination of MEO activities. A good voice-quality, dedicated, commercial telephone circuit is required for transmitting processed seismic data from the seismic van to a remote time-shared computer for computation of seismic signal source locations, and a standard dial telephone service is needed to obtain supplies and services.

Security of Operating Sites

For safety reasons, spectators, nonoperating personnel, and others not having authorized business must be kept clear of the operating sites and base camp. Physical security and traffic control are also required to protect supplies and equipment and to prevent interference with necessary vehicular traffic.

Site Activity

Conditions encountered will dictate changes in the operating procedure as the rescue operation progresses, and operational flexibility is essential to the effective performance of the rescue mission. For continuity of operations the Chief, MEO Group, indicates the MESA officials authorized to act in his behalf during those periods of time that he is required to be absent from the emergency site.

Each Manager and Supervisor maintains a complete record of events under his purview for inclusion in a final report of the emergency deployment operation.

Rescue activity is terminated when directed by the Chief, Mine Emergency Operations Group, and demobilization commences.

Demobilization

In general, when the deploy condition is terminated, all the equipment is returned to respective facilities, and the MEO Group personnel resume regular assignments. However, under special conditions the Chief, MEO Group may direct early demobilization of specific personnel or units of equipment, or he may require that specific units, for example, the gas sampling equipment, remain on site until otherwise directed.

Operating personnel are responsible for the disassembly and repacking of each piece of equipment in accordance with instructions in the appropriate manuals. The Supervisor, Operations Support determines the loading procedures for transport and the sequence of departure. An inventory of each item, including all support equipment, should be completed before departure from the

operating area. All packages are tagged clearly to provide a means of positive identification.

Arrangements to return to the staging facility are coordinated through the State police and other responsible government agencies.

Highway over-load concessions granted during the emergency move to the site may not be granted in full when returning equipment to the staging facility. Therefore, some dismantling of equipment may be necessary to more nearly comply with State highway limitations.

Site Restoration

Probe and rescue holes are plugged if they are not useful for mine operations, and the rescue site is cleaned and all disposable items are removed.

The Deputy Chief for Westinghouse, or his designated representative with the concurrence of Chief, Mine Emergency Operations Group, obtains property damage releases and arranges for payment of all reasonable and proper claims incurred as a result of a MESA emergency deployment operation.

The property lease and mineral rights agreement negotiated by many mine operators allow the mines a wide latitude in accessing and using the land above the mine workings. However, in the event that such conditions do not prevail, it may be necessary to negotiate individual agreements with property owners for restoration of property to original condition or compensation for defacement or other damage. In either case, release agreements must be obtained from property owners, releasing the government from future claims based upon the emergency operations.

Refurbishment

As soon as the equipment is returned to the respective staging facilities, intensive efforts should be undertaken immediately to restore all equipment to full serviceability, ready for response to subsequent mine emergencies. For the seismic unit, the c/c van and the supply van, Westinghouse MEO Group personnel perform repairs and refurbishment. For the drill unit, Rowan Drilling Company assigns special crews to work steadily until repairs and refurbishment are completed. Such refurbishment efforts may require up to 1 month to complete, depending upon the severity and length of the on-site operations.

Concurrently with refurbishment, complete inventories of all MEO material, equipment, and spares are conducted and complete restocking actions are initiated.

Personnel Manning Levels

Table 1 depicts the base-line manning levels associated with the various levels of deployment. These figures are modified as circumstances dictate.

TABLE 1. - MEO group personnel manning levels

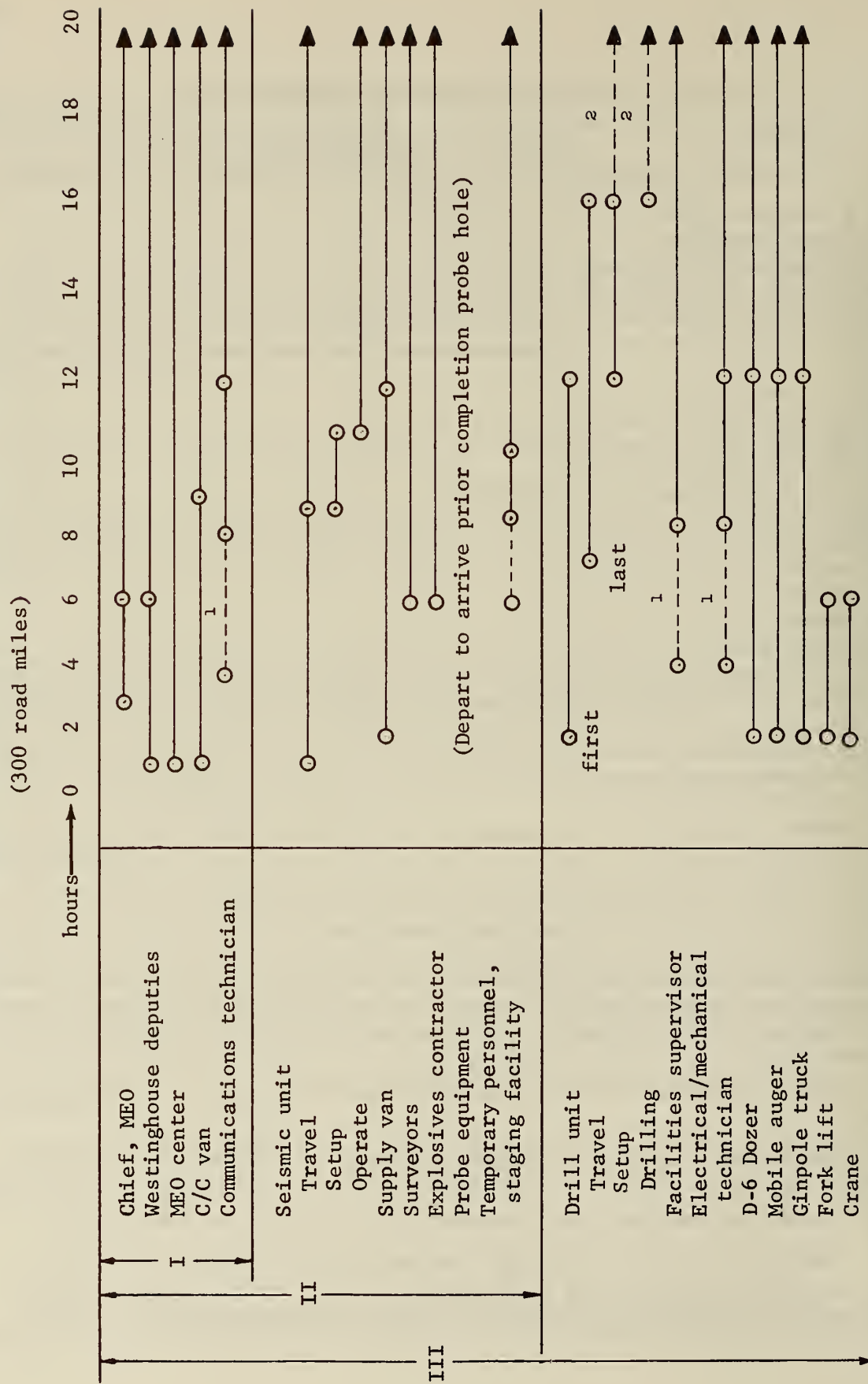
Personnel	Organization				Cumulative total
	MESA	Westinghouse	Rowan	Vendor	
Level I:					
Chief & Engineer, MEO.....	2	-	-	-	2
Westinghouse deputies.....	-	2	-	-	4
Logistic team.....	-	4	-	-	8
Communications operators...	-	2	-	-	10
Communications technicians.	-	2	-	-	12
Total Level I.....	2	10	-	-	12
Level II:					
Logistics personnel.....	-	2	-	1	15
Seismic crews.....	-	8	-	-	23
Rowan deputies.....	-	-	2	-	25
Facilities personnel.....	-	1	-	-	26
Electronic technicians.....	(2) BuMines	-	-	-	28
Surveyors.....	-	-	-	3	31
Explosives crew.....	-	-	-	2	33
Dozer operator.....	-	-	-	1	34
Truck driver.....	-	-	-	1	35
Auger operator.....	-	-	-	1	36
Electromechanical technicians.....	-	2	-	-	38
Total Levels I and II.	4	23	2	9	38
Level III:					
Forklift operator.....	-	-	-	1	39
Crane operator.....	-	-	-	1	40
Drill equipment haulers....	-	-	-	15	55
Drill crews.....	-	-	11	-	66
Total Levels I, II and III.....	4	23	13	26	66

Deployment Schedule

Tables 2 and 3 depict representative departure and arrival schedules of personnel and equipment under the three levels of deployment for Eastern and Western emergencies respectively. Planning factors used in developing these tables include:

1. Road and weather conditions do not impede movement of personnel or equipment.
2. The emergency site and adjacent terrain are accessible to the MEO equipment.
3. Supporting equipment and services are available as requested.
4. Emergency site is within 300 road miles of a staging facility.
5. A Western emergency is 2,000 airmiles from the Charleston facility and two hours road time from the nearest usable western airport.

TABLE 2. - MESA MEO group equipment deployment--east

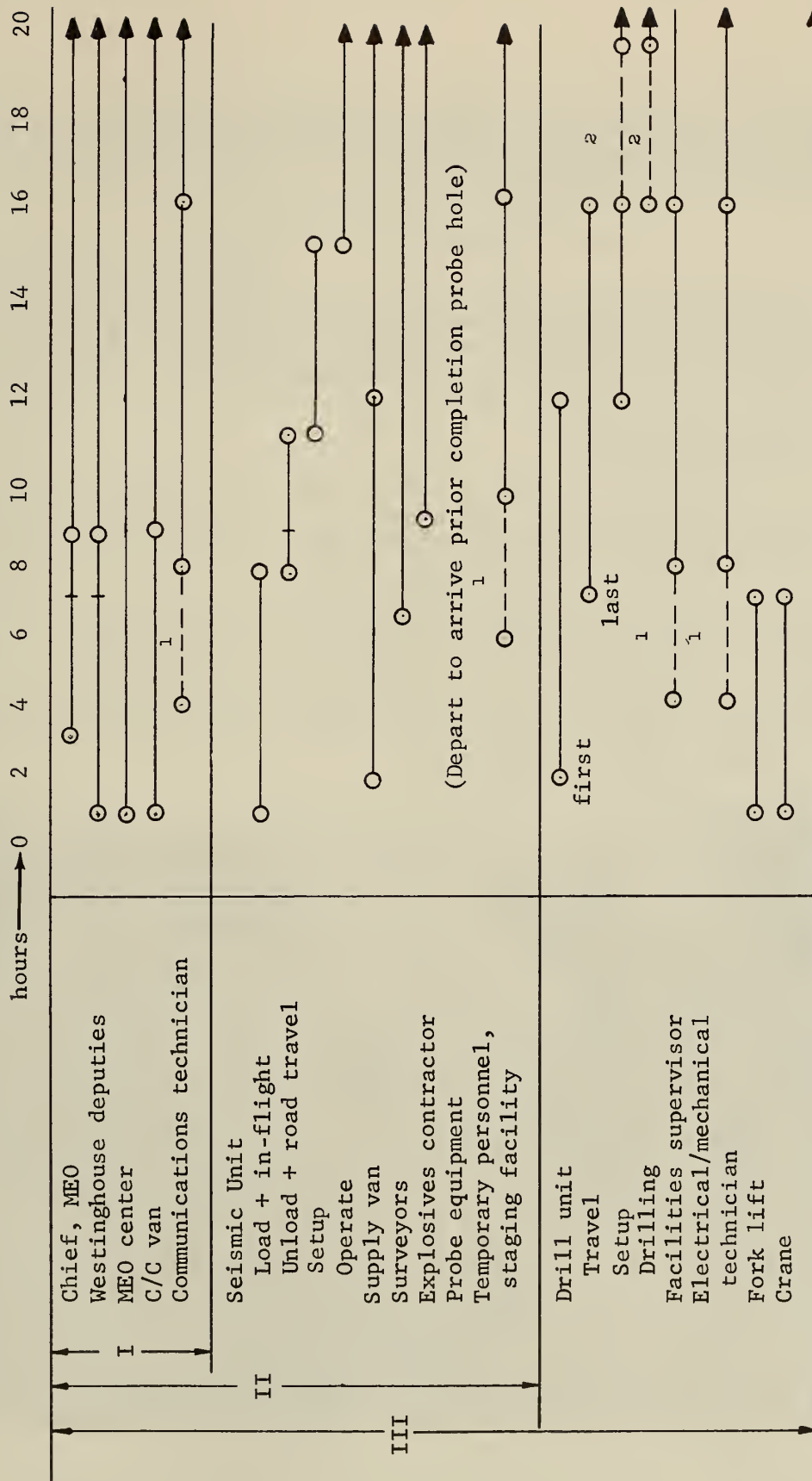


¹Commercial air. Departures are schedule-dependent.

²Spud-in is 4 to 8 hours after setup starts.

TABLE 3. - MESA MEO group equipment deployment--west

(300 road miles--2,000 air miles)



¹Commercial air. Departures are schedule-dependent.

²Spud-in is 4 to 8 hours after setup starts.

It should be clearly understood that the time and sequence of movement depicted in the tables are derived directly from the conditions and assumptions postulated above for planning purposes only and should not be construed as representing actual operating schedules.

Mine Rescue and Recovery Resources

The following specific MESA resources and capabilities are representative of the support available for mine rescue and recovery operations. On-site operations and/or investigations are under the direction of the ranking line official of the appropriate Assistant Administrator.

Emergency Mine Rescue Unit

The MESA Emergency Mine Rescue Unit provides an in-mine search and rescue capability, and consists of 16 fully equipped, highly trained and experienced rescue personnel from Coal Mine Districts 2 and 3. Figure 7 shows MESA mine rescue teams in training. Supplemental equipment includes a self-propelled van used for equipment and rescue support. This unit is under the direction of the Assistant Administrator--Coal Mine Health and Safety and is headquartered and trained at Coal Mine District 2, 4800 Forbes Avenue, Pittsburgh, Pa. The unit is deployed only in situations where possible loss of life is involved and where other mine rescue teams are not readily available. Although primarily used for coal mine emergencies, these rescue teams are available for metal and nonmetal mine emergency use.



FIGURE 7. - MESA mine rescue team during simulated emergency rescue.

When alerted, personnel of the unit assemble at the Pittsburgh headquarters and prepare for immediate deployment should their assistance be requested and/or directed. If the mine site is not within reasonable driving distance, transportation is usually via C-130 type chartered or military aircraft with pickup at the Pittsburgh airport.

Technical Evaluation Teams

Ventilation expertise is provided in the form of a Technical Evaluation Team comprised of personnel from the MESA Pittsburgh and Denver Technical Support Centers. These personnel deploy to a mine emergency along with either the Emergency Mine Rescue Unit or the Mine Emergency Operations Group.

The following MESA personnel are on standby to participate in rescue and recovery operations:

1. Chiefs, Ventilation Groups, Pittsburgh and Denver Technical Support Centers.
2. Chiefs, Roof Control Groups, Pittsburgh and Denver Technical Support Centers.
3. Chief, Safety Division, Coal or Metal and Nonmetal Mine Health and Safety.
4. Chief, Health Division, Coal or Metal and Nonmetal Mine Health and Safety.
5. District Managers other than the District Manager in whose district the operations are conducted.

Gas Chromatograph and Analytical Unit

MESA maintains a portable gas chromatograph with operating personnel at Headquarters, Coal District 2, Pittsburgh, Pa. Services may be obtained from the Manager of the District. Additional chromatographic and analytical services may be obtained from the Pittsburgh and Denver Technical Support Centers and the Bureau of Mines Pittsburgh Mining and Safety Research Center. Field support for the initial setup and continued gas analysis operation at the site as well as additional services may be obtained through the logistical support function of the Mine Emergency Operations Group Support Center at Baltimore, Md.

Inventory of Mine Rescue Teams and Equipment

A listing of rescue teams and equipment available throughout the United States is contained in a MESA document entitled, "Inventory of Mine Rescue Teams and Equipment," which provides information concerning what is available, where located, and who to contact to obtain it. Resources available at MESA District and Subdistrict offices, coal mines, metal and nonmetal mines, and State agencies are included in this inventory. This document is updated semi-annually and is available at all district offices.

INVESTIGATION, OFFICIAL HEARING, AND REPORT

Whereas the investigation as to the cause of a mine disaster is not the function of MEO, all persons who were involved in the MEO operations are subject to call for information and consultation during the investigation, as witnesses during the official hearing, and as participants in the preparation of the final report on the disaster.

EMERGENCY RESPONSES

In the short period of time since MEO was established, significant assistance has been provided at five mine disasters, including the Blacksville coal mine disaster in West Virginia on July 22, 1972, and the Sunshine metal mine disaster in Idaho on May 2, 1972.

SPECIAL SERVICES

States, Mining Company, and Miners

To the extent possible, the MESA search and rescue operations are coordinated with any such operations conducted by appropriate State officials and agencies. Representatives of the State, company, and the mine workers are afforded an opportunity to participate in and be informed of such operations as may be appropriate under the circumstances.

Air Force

A Memorandum of Understanding between MESA and the Air Force, covering Air Force airlift in support of MESA's Mine Emergency Operations, was consummated in April 1974. A copy thereof and of the transmittal letter are included in Appendix E.

National Park Service

A Memorandum of Understanding between the National Park Service and MESA, covering the use of MESA's Mine Emergency Operations equipment and personnel in case of an emergency in caves operated by NPS, was consummated in May 1974. A copy thereof and of the transmittal letter are included in Appendix F.

APPENDIX A.--CONTRACT NO. S0190606 BETWEEN THE UNITED STATES OF AMERICA
AND NATIONAL ACADEMY OF SCIENCES

This contract is entered into this twenty-sixth day of February 1969 by the UNITED STATES OF AMERICA, (hereinafter called the "Government"), acting through the Bureau of Mines, Department of the Interior, and the NATIONAL ACADEMY OF SCIENCES, a corporation Chartered by the Congress of the United States (hereinafter called the "Contractor"), located in Washington, D.C. 20418.

The Government desires to have services performed which will be directed toward an assessment of the technological capabilities that may be applied to survival and rescue techniques in mining disasters.

The Contractor has submitted a proposal for the support of a study on mining rescue and survival techniques and represents that it has the experience, general physical facilities, equipment and personnel having the necessary knowledge, training and skill to conduct such a study and is able and willing to undertake the same.

This contract is authorized by and executed pursuant to the Department of the Interior and Related Agencies Appropriations Act for FY 1969 (P.L. 90-425, dated July 26, 1968), and negotiated pursuant to Findings and Determinations under Section 302(c)(10) of the Federal Property and Administrative Services Act of 1949, as amended (41 U.S.C. sec. 252(c)(10)).

THE PARTIES AGREE AS FOLLOWS:

ARTICLE I--SCOPE OF WORK

Sec. 1.1 The National Academy of Sciences through the National Academy of Engineering shall conduct a study program to assess the technological capabilities that can be applied to survival and rescue techniques following mining disasters. The National Academy of Engineering shall appoint a Committee on Mining Rescue and Survival Techniques to conduct this study.

Sec. 1.2 The study to be conducted by the National Academy of Engineering's committee on mining rescue and survival techniques shall have as its primary concerns the degree to which mine workers' prospects of survival might be improved in the event of any circumstance that precluded their normal withdrawal from a mine and the prospects of improving rescue procedures. Consideration shall be given to improving the effectiveness of existing devices and to describing the technological possibilities of new devices or equipment that may make it possible to improve significantly workers' chances of survival in the environments that prevail following disasters.

Sec. 1.3 Included in this study shall be attention by the Contractor to technological advances in related fields such as space exploration, deep submergence, and civil defense, which might lead to significant improvements in mine rescue techniques and equipment.

ARTICLE II--REPORTS

As a part of the work to be performed pursuant to this contract, the Contractor shall submit to the Contracting Officer the following reports in accordance with the delivery schedule set forth in Article III--Delivery:

Sec. 2.1 Five (5) copies of a quarterly progress report shall be submitted to the Contracting Officer, and shall contain results of the effort conducted during the previous three month reporting period. Each quarterly progress report shall be in sufficient detail to disclose all work started and results achieved during the reporting period (including any successful efforts and a comparison between expectation and achievement), work forecast for the next quarter, and a statement of funds expended during the reporting period and cumulative to date. A quarterly progress report need not be submitted for the final three months of contract performance.

Sec. 2.2 Upon completion of the work described in ARTICLE I--SCOPE OF WORK, the Contractor shall prepare and submit to the Contracting Officer a final report (5 copies) covering in detail all work accomplished under the contract. The final report shall document and summarize the results of the entire contract work, including recommendations and conclusions based on the experience and results obtained. The final report may include tables, graphs, and diagrams in sufficient detail to comprehensively explain the results achieved under the contract. One copy of the final report shall be prepared in a manner suitable for reproduction by a photographic process. The typing shall be single spaced on one side of the sheet only, and all photographs shall consist of glossy prints.

Sec. 2.3 In addition to the aforementioned written reports, the Contractor shall be prepared to discuss orally any phase of contract performance or progress as required by the Contracting Officer.

Sec. 2.4 All information derived from the performance of this contract, and all technical data and reports required hereunder, shall become the property of the Government, and the Contractor, without additional compensation, hereby grants to the Government the full right to use or publish the data and reports. The Contractor agrees not to publish or make available to others, except representatives of the Contracting Officer, the results of the work under this contract or any information concerning the same, without approval in writing from the Contracting Officer.

ARTICLE III--DELIVERY

A. Schedule of Deliverable Items:

<u>Description</u>	<u>Quantity</u>	<u>Delivery Date</u>
1. Quarterly Progress Report (Article II. Sec. 2.1)	5 copies	Due within fifteen (15) days after each three months of contract performance excluding the final three months
2. Final Report	5 copies (including reproducible master)	Due on or before March 31, 1970

B. Period of Performance--All work under this contract (ARTICLE I--SCOPE OF WORK) shall be completed by February 28, 1970.ARTICLE IV--CONDITIONS OF OPERATIONS BY CONTRACTOR

Sec. 4.1 The Contractor assures the Government that the work performed by its personnel under this contract will be done in a proficient manner and conform to high professional standards.

Sec. 4.2 The Contractor shall be responsible for the payment of salaries and allowances to personnel assigned by it to work under this contract and for the payment of any other expenses authorized under the terms of this contract. All administrative arrangements for personnel assigned to work under this contract will be the responsibility of the Contractor.

Sec. 4.3 The Contractor shall not, without the prior written approval of the Contracting Officer, lease or rent equipment for use under this contract if the charge for such equipment exceeds \$100.00. The Government may, at its option, furnish such supplies or equipment as it may from time to time deem necessary or desirable for use in performing the work under this contract. The Contractor shall be responsible for the proper use, care, and safe return (ordinary wear and tear excepted) of all nonexpendable equipment or property purchased or rented by the Contractor or furnished by the Government.

Sec. 4.4 The Contractor represents that it is not now performing, has not previously performed, and does not at this time contemplate, for any other public or private agency, effort that duplicates work described in this contract.

Sec. 4.5 The Contractor shall perform its work under this contract in an independent manner and use all reasonable effort to avoid any duplication or work previously or currently being performed by the Contractor or by others.

ARTICLE V--FINANCIAL PROVISIONS, ESTIMATES OF COSTS

Sec. 5.1 The estimated cost of the work to be performed by the Contractor under this contract is \$74,900.00. In no event will the Government be obligated to reimburse the Contractor for costs incurred in excess of \$74,900.00 unless prior to incurring the excess costs the Contractor has notified the Contracting Officer in writing, and the Contracting Officer has notified the Contractor in writing that such estimated cost of \$74,900.00 has been revised upward in an amount adequate to cover such excess costs. The Contractor shall use its best efforts to perform the work specified in this contract within such estimated amount.

Sec. 5.2 The Contracting Officer may, by written notice to the Contractor, revise the estimated cost of this contract, and from time to time further revise any revised estimate of such costs, including, but not limited to, transfer of funds between cost categories.

Sec. 5.3 Subject to the provisions of Section 5.1 of this Article the Contractor shall be reimbursed with respect to direct costs incurred in the performance of work under this contract as follows:

(a) Base salaries and wages paid in accordance with the Contractor's established practice to personnel while such personnel are engaged in performing work directly related to this contract, and fringe benefits for vacations, holidays, sick leave, pensions, insurance, and social security paid or accrued, in accordance with the Contractor's established practice, to such personnel. These costs are estimated at \$35,200.00.

(b) Communications and shipping expenses estimated at \$1,200.00.

(c) Cost of materials and services. These costs are estimated at \$5,100.00.

(d) Transportation expenses plus reasonable actual subsistence expenses, in an amount not exceeding \$25.00 per person per day or fractional part thereof, if subsistence expenses are itemized, or an allowance in lieu of actual subsistence expenses not exceeding \$20.00 per person for each calendar day or \$5.00 for each quarter day thereof during the period of travel, of all persons engaged by the Contractor directly on the contract work. In the event the period of travel is wholly within a single calendar day, subsistence expenses may be claimed only on an actual basis. Expense for transportation by privately owned car will be reimbursed on a mileage basis at a rate not exceeding ten cents (10¢) per mile, plus toll charges and necessary parking fees, if any, provided that the cost of travel by privately-owned car plus related subsistence expenses does not exceed the cost of travel by common carrier. These costs are estimated at \$14,000.00.

Sec. 5.4 For indirect costs allocable to this contract, the Contractor shall be reimbursed as follows:

(a) A proportionate share of the Contractor's overhead costs allocable to this contract estimated at \$19,400.00 and computed at the provisional billing rate of 35 percent of direct costs as determined in accordance with Section 5.3 of this Article.

(b) The provisional overhead rate established in paragraph (a) of this section is subject to audit by the Contracting Officer (or, if arranged by the Contracting Officer, by any other U. S. Government agency) to determine the Contractor's actual overhead allocable to this contract for the period involved. In the event that any such audit reveals that the actual rate is greater or less than the provisional rate, an adjustment upward or downward shall be made accordingly in the Contractor's billings for the period covered by the audit. The rate established by any such audit shall become the provisional rate for the Contractor's ensuing fiscal year, if any, under this contract, and shall be subject to audit and adjustment.

Sec. 5.5 The determination and allowability of costs, either direct or indirect, for which payments shall be made under this contract shall be in accordance with Subpart 1-15.2 of the Federal Procurement Regulations (43 CFR, Subpart 1-15.2) entitled "Principles and Procedures for Use in Cost Reimbursement Type Supply and Research Contracts with Commercial Organizations" in force upon the effective date of this contract. Subpart 1-15.2 is hereby incorporated by reference and made a part of this contract.

Sec. 5.6 (a) Payments to the Contractor will be made once each month to the Contractor for expenditures made in accordance with Sec. 5.3 upon certification and delivery to and verification by the Contracting Officer, or his authorized representative, of public voucher. All vouchers submitted shall summarize the item for which payment is requested, and be prepared and certified in a manner and form mutually agreed to by the Contractor and Contracting Officer. Documents supporting each voucher shall be retained by the Contractor for audit by appropriate Government Audit Agency, or be submitted with each such voucher as may be directed by the Contracting Officer.

(b) The Contracting Officer may withhold all or any part of the final reimbursement payment until receipt of the final report which is called for under Sec. 2.2 of Article II--Reports. Upon completion of the subject work and its final acceptance, the Government shall pay to the contractor the unpaid balance of the estimated cost of work determined under Sec. 5.1, less any sum that may be necessary to settle any unsettled claims in connection with this contract, or any claim the Government may have against the Contractor.

ARTICLE VI--PROJECT OFFICER

Mr. Thomas E. Howard, Director of Mining Research, is hereby designated as Contracting Officer's representative to act as Project Officer under this contract. The Project Officer will receive, for the Government, reports and

other material called for in this contract and will represent the Contracting Officer in the technical phases of the work. The Project Officer is not authorized to change any of the terms and conditions of this contract. Changes in the Scope of Work will be made only by the Contracting Officer by properly written modifications to the contract. Additional Contracting Officer's Representative for other purposes as required may be designated in writing by the Contracting Officer.

ARTICLE VII--KEY PERSONNEL

The following individual is considered essential to the work being performed under this contract and substitutions will not be made without the prior written approval of the Contracting Officer:

Mr. Robert L. Stern

ARTICLE VIII--EFFECTIVE DATE AND COMPLETION OF WORK

Sec. 8.1 The effective date of this contract shall be date first written above.

Sec. 8.2 The Contractor shall complete the work specified in this contract not later than February 28, 1970.

ARTICLE IX--GENERAL PROVISIONS

The General Provisions attached to this contract as Appendix A are hereby made a part of this contract.

IN WITNESS WHEREOF, the parties have executed this contract on the date and year first hereinabove written which is the date of signing by the last signatory.

NATIONAL ACADEMY OF SCIENCES

THE UNITED STATES OF AMERICA

By /s/ Merile A. Tuve

By /s/ G. A. Melville
Contracting Officer

Title Home Secretary

Date February 28, 1969

Date March 5, 1969

Accounting Data
9-1411-31-6004

Modification Number I to Contract No. S0190606 Between the United States
of America and National Academy of Sciences

WHEREAS, the Government and the Contractor entered into Contract No. S0190606 under date of February 26, 1969, which, together with any and all amendments, changes, modifications, and supplements thereto, is hereinafter referred to as "the contract," and

WHEREAS, the Contractor has formally requested by letter dated February 6, 1970, that subject Contract be amended to extend the period of performance from February 28, 1970, until April 30, 1970, without any increase in the contract price, and

WHEREAS, the Contractor has reviewed the work under this contract and as a result has determined that additional time is needed to satisfactorily complete the work contemplated, and

WHEREAS, it has been determined that the work outlined under this Contract is still very much needed and the time delay will not affect the Bureau's planned work associated with this project;

NOW THEREFORE, in consideration of the premises and of the obligations herein set forth, the parties hereto do mutually agree as follows:

FIRST: Paragraph B. under ARTICLE III--DELIVERY is hereby deleted in its entirety and the following is hereby substituted in lieu thereof:

"B. Period of Performance--All work under this contract
(ARTICLE I--SCOPE OF WORK) shall be completed by
April 30, 1970."

SECOND: It is understood by both parties hereto that this contractual modification is entered into at no increase in the total contract price.

THIRD: Except as hereby modified, all terms and conditions of said contract remain unchanged and in full force and effect.

NATIONAL ACADEMY OF SCIENCES

THE UNITED STATES OF AMERICA

By /s/ P. Handler

By /s/ G. A. Melville
(Contracting Officer)

Title President

Date March 3, 1970

Date March 13, 1970

Amendment No. I to Contract No. S0190606 Between the United States of America
and National Academy of Sciences

WHEREAS, the Government and the Contractor entered into Contract No. S0190606 under date of February 26, 1969, which, together with any and all amendments, changes, modifications, and supplements thereto, is hereinafter referred to as "the contract", and

WHEREAS, the Contractor has formally requested by letter dated March 6, 1969, that subject contract be amended to modify Sec. 2.4 of ARTICLE II--REPORTS, in order to formalize the understanding reached at the time of contract execution between the parties hereto;

NOW THEREFORE, in consideration of the premises and of the obligations herein set forth, the parties hereto do mutually agree as follows:

FIRST: Sec. 2.4 of ARTICLE II--REPORTS is hereby deleted in its entirety and the following paragraph is substituted in lieu thereof:

"Sec. 2.4 All information derived from the performance of this contract, and all technical data and reports required hereunder, shall become the property of the Government, and the Contractor, without additional compensation, hereby grants to the Government the full right to use or publish the data and reports. The Contractor agrees not to publish or make available to others for a period of six months following the termination date of this contract, except representatives of the Contracting Officer, the results of the work under this contract or any information concerning the same, without approval in writing from the Contracting Officer. This paragraph does not apply to the exchange of information among those who are officially connected with the work under the contract."

SECOND: It is understood by both parties hereto that this contractual modification is entered into at no increase in the total contract price.

THIRD: Except as hereby modified all terms and conditions of said contract remain unchanged and in full force and effect.

NATIONAL ACADEMY OF SCIENCES

THE UNITED STATES OF AMERICA

By /s/ F. Seitz

By /s/ G. A. Melville
Contracting Officer

Title President

Date June 2, 1969

Date June 6, 1969

APPENDIX B.--LEASED EQUIPMENT AND SERVICES REQUIREMENTS

Seismic Equipment Support

Registered surveyor, preferably with day/night, all-weather survey capability.

Auger or hard rock drill, as required by the surface geology.

Explosives handler to procure, set, and detonate 1 pound to 6 pound charges for seismic system calibration.

Telephone line, commercial voice quality, to link the seismic location system to a remote computer facility.

Diesel electric generator, 480 volt, 20 KW, 3-phase, on rubber tired trailer.

Rescue Drill Equipment Support

Leased for Road Transportation

One truck tractor for the drill rig, 54-ton capacity, off-road capability.

Trucks with trailers and heavy duty winch, capable of hauling 30-ton skids 8 feet wide and 39 feet long, with off-road capability, to haul skids for the drill rig.

One crane or heavy duty tandem gin pole truck to unload and reassemble drill rigs and equipment at each location required.

Leased to Position and Erect Rigs

Three crawler tractors (Caterpillar D-6 or equivalent as a minimum) with winch line, gin poles, and hydraulic blades, for site access road and site preparation, equipment towing, and off loading. (More may be required in adverse weather or terrain.)

One boring machine or back-hoe for burying guy line anchors for each drill rig. Selection of borer or back-hoe depends upon surface geological formation:

Boring machine for 9-inch diameter holes, 6 feet deep, is needed only for anchoring in competent formations.

Back-hoe for burial trenches 6 feet long and 4 feet deep is needed only for anchoring in soft formations.

Welding service, portable gas and electric, if needed to supplement welding equipment carried with each drill rig, to make repairs and minor field modifications to primary and support equipments.

Leased to Support Drilling Operations

Air compressors:

For probe drill configuration:

1,100 cfm at 200 psig (special purpose).
1,200 cfm at 350 psig.

For rescue drill configuration:

900 cfm at 100 psig.

Mist pump, skid mounted with diesel engine drive and three-speed transmission, complete with lines and fittings, for water and soap injection during direct air circulation. Circulation rate should be 35 to 50 gpm at 800 to 1,000 psig.

Water services:

For probe drilling, 100 to 800 barrels per day depending upon circulation method, delivered to the 270-barrel storage tank or the steel mud pit.

For rescue drilling, 200 to 1,800 barrels per day delivered to the 270-barrel storage tank or the steel mud pit.

Diesel fuel, 350 to 700 gallons per day, delivered to the 1,000-gallon tank on each rig. Additional fuel as required for support of trucks, tractors, air compressors, and electric generators.

Lubricating oils, greases, hydraulic oils, turbine oils, chain oils, as required.

Drilling mud clay, chemicals, soap, and other additives as needed for the circulating system.

Cementing services as required.

Casing, as required:

For probe hole, 9-5/8-inch surface outer diameter with threaded connections.

For rescue hole, 30-inch surface outer diameter with welded connections.

Antifreeze and salt, as required.

Field Operations Support

Medical service.

Commercial telephone lines, at least three, preferably six lines.

Commercial electrical power.

Field food service.

Field toilets.

Kelley heaters.

Potable water and drinking facilities.

Mine gas sampling service.

Barricades with flashing light.

Security and spectator control assistance as required.

APPENDIX C.--MOVEMENT OF MEO SUPPORT EQUIPMENT

General

In the Ready Configuration the equipment at the staging facilities is positioned and arranged so that it can be expeditiously loaded out and moved via highways. However, the services of a Heavy Hauler, with suitable tractor trucks and floats, is required to move the drill rigs, skid mounted ancillary equipment, equipment, and the supply vans.

The dimensions and weights of the major assemblies as maintained in their Ready Condition for highway transportation are contained in table C-1.

TABLE C-1. - Dimensions and weights of major equipment

Equipment No.	Equipment	Weight	Length	Width	Height
EASTERN STAGING FACILITIES					
1A	Trailer mounted drill rig.....	70,520	52'	9'6"	11'
1B	Drill rig derrick.....	20,400	71'	9'	7'
2	Spare parts house.....	15,580	27'	7'6"	8'2"
3	Auxiliary house.....	24,860	30'3"	10'	8'6"
4	Substructure.....	11,800	14'8"	7'3"	4'10"
5	Drill rig attachments skid.....	19,790	20'	7'7"	6'
6	Catwalk and drill rig attachments...	40,100	39'	6'	5'
7	Water tank.....	20,000	35'	7'10"	8'6"
8	Drill pipe skid.....	34,830	34'10"	7'2"	4'
9	Mud pit.....	19,000	37'	7'10"	7'
10	Vacuum separator.....	35,000	38'10"	8'	8'6"
11	Centrifugal pump skid.....	10,570	15'3"	7'10"	8'9"
12	Substructure extension.....	-	-	-	-
13	Drill pipe skid.....	34,830	34'10"	7'2"	4'
14	do.....	50,990	34'10"	7'2"	4'
15	do.....	50,990	34'10"	7'2"	4'
16	Mud pump assembly.....	23,600	19'6"	9'6"	8'1"
17	Power pump assembly.....	8,000	12'6"	7'6"	6'
18	Drill rig office skid.....	10,400	35'	8'	8'6"
19	Stabilizer and donut skid.....	19,200	12'6"	6'8"	4'9"
20	Donut skid.....	18,000	12'6"	6'8"	3'3"
21	do.....	18,000	12'6"	6'8"	3'3"
23	Mist pump skid.....	-	-	-	-
24	Seismic system (Porta-Kamp).....	8,000	17'6"	8'	8'9"
	Ford F100 tilt bed truck.....	12,000	26'10"	8'	7'6"
25	EM system (Porta-Kamp).....	8,000	17'6"	8'	8'9"
	Ford F100 tilt bed truck.....	12,000	26'10"	8'	7'6"
27	Auxiliary truck--versa drill.....	21,600	26'10"	8'	11'6"
28	Logistics trailer.....	24,000	40'	8'	12'4"
41	Quincy 1200 air compressor.....	-	-	-	-
42	Trailer, lowboy, Wisconsin.....	-	-	-	-
43	Tractor, Caterpillar D6C.....	-	-	-	-
44	Tractor, Peterbilt.....	-	-	-	-

TABLE C-1. - Dimensions and weights of major equipment--Continued

Equipment No.	Equipment	Weight	Length	Width	Height
EASTERN STAGING FACILITY--Continued					
46	Avco c/c van.....	20,000	28'	8'	10'6"
47	Auger.....	-	-	-	-
48	Mobile generator, 21.5 KW #1.....	4,000	12'6"	6'8"	7'6"
49	Mobile generator, 21.5 KW #2.....	4,000	12'6"	6'8"	7'6"
60	Fuel tank, 1,000 gallon, skid mounted	-	-	-	-
WESTERN STAGING FACILITY					
1	Drill rig.....	107,130	71'	9'6"	13'9"
	With derrick removed.....	75,130	52'	9'6"	11'
	Derrick.....	32,000	71'	9'	7'
2	Substructure--28-1/2".....	27,770	18'2"	8'3"	4'8"
3	Pipe racking substructure.....	-	15'11"	6'7"	5'8"
4	Catwalk/drill collars.....	40,000	39'	6'	3'
5	Drill rig attachments.....	28,450	21'6"	7'7"	6'
6	Vacuum separator.....	35,000	38'10"	8'	8'6"
7	Auxiliary House with fuel tank 30K..	24,860	29'10"	7'6"	8'6"
8	Centrifugal pump skid.....	10,570	15'3"	7'10"	8'9"
9	Spare parts house.....	15,580	27'	7'6"	8'2"
10	Drill pipe tub 8-5/8".....	50,990	34'10"	7'2"	4'
11	do.....	50,990	34'10"	7'2"	4'
12	Drill pipe skid--5".....	34,830	34'10"	7'2"	4'
13	Drill pipe tub--2-7/8".....	34,830	34'10"	7'2"	4'
14	Water tank 30K.....	20,000	35'	7'10"	8'6"
15	Mud pit.....	20,000	37'	7'10"	7'
16	Mud pump.....	-	-	-	-
17	Donut skid.....	18,000	12'6"	6'8"	3'3"
18	do.....	18,000	12'6"	6'8"	3'3"
19	Donut & stabilizer.....	19,200	12'6"	6'8"	4'9"
20	Rig office.....	10,400	35'	8'	8'6"
21	Supply van.....	-	-	-	-
22	Avco--c/c van.....	-	-	-	-
23	Generator trailer.....	-	-	-	-

The major equipment except the c/c van and supply van can be disassembled or rearranged for airlift by an aircraft with minimum capabilities of a C-130 type aircraft and by helicopter with the capabilities of a sky crane. The Seismic/Location shelter and tilt bed truck can be loaded as separate units as can the auxiliary truck and other seismic support equipment. The drill rigs require extensive disassembling for airlift and while it is possible to do so, it is very time consuming and considered unrealistic in view of the complete drilling capability maintained at each staging facility.

Dimensions, weights, and composition of rescue resources most likely to be airlifted are contained in table C-2.

TABLE C-2. - Mine emergency rescue resources configured for airliftPITTSBURGH, PA.

MINE EMERGENCY RESCUE TEAM

19 men--2,000# equipment

Ford Econoline Van, 6'7" High, 15' Long, 8' Wide, 5,500#

BUMINES PROBE TRUCK

100" High, 24' Long, 8' Wide, 20K pounds--weight

CHARLESTON, W. VA.

SEISMIC SYSTEM

	<u>Height</u>	<u>Length</u>	<u>Width</u>	<u>Weight</u>
Porta Kamp.....	100"	17'6"	8'	8,000#
F100 truck.....	90"	26'10"	8'	12,000#
Mobile generator...	90"	12'6"	6'8"	4,000#
Auxiliary truck....	103"	26'10"	8'	25,000#
Versa drill.....	77"	13'6"	56 1/2"	3,520#

(Crawler Tracks 36" inside--56" outside)

Rescue capsule Length Total 235 1/4" Weight 1,600#
 Other equipment 3,000#

Following is a list of vehicle equipment by location for which Government license plates have been issued:

<u>Description</u>	<u>Eastern facility</u> <u>license #</u>	<u>Western facility</u> <u>license #</u>
EM truck.....	I-22004	-
Seismic truck.....	I-22008	-
Command vehicle.....	I-22107	I-20386
Auxiliary truck.....	I-22002	-
Supply trailer.....	I-22103	I-22013
21.5 KW generator #1	I-20407	-
Drill rig.....	I-20383	I-20384
Trailer, lowboy.....	I-20389	-
21.5 KW generator #2	I-11673	-
33.5 KW generator...	-	I-20388
Auger.....	I-11675	-
Peterbuilt truck....	I-11674	-

Movement by Truck

Description

For moving equipment by road, a truck tractor is required for the drill rig and supply van. Truck tractors with trailers are required for the skid-mounted drill support equipment and they will be procured from vendors.

Total weight and overall dimensions of the drill rigs place them in a category requiring special permission to utilize the highway systems of many States. All other equipment is within load size and weight limits for routine road transportation.

Following is a list of support requirements and truck loads for the movement of heavy equipment:

Support Requirements for Movement by Truck

- | | |
|-----------------|--|
| 1 each..... | Crane or heavy duty tandem gin pole truck at the staging facility to load trucks. |
| 2 each..... | Truck tractor with fifth wheel to tow the drilling rig to the drill site. |
| 2 each..... | Truck tractors with pole trailers to tow derricks. |
| 9-11 loads..... | Trucks with trailers to transport ancillary equipment to drill site. |
| 1 each..... | Truck, heavy duty tandem rig-up type with gin poles, at the drill site or destination staging area, to unload and handle equipment. |
| 3 each..... | Crawler tractor with winchline and gin poles, at the drill site or destination staging area, to tow trucks and handle equipment as required. (Additional tractors needed if mud, snow, or rough terrain is encountered.) |
| 1 job..... | Escort by highway patrol or other agency as required. |

Drill Rig Truck Loads

Drill rig (truck tractor only).....	1 load
Drill rig derrick.....	1 load
Office skid.....	1 load
Spare parts house.....	1 load
Utility skid.....	1 load
Substructure rotary.....	1 load
Separator.....	1 load
Drill rig attachments--centrifugal pump.....	1 load
Water tank.....	1 load
Mud pit, shaker, hoses.....	1 load
Compressor-power pump-1,000 gal tank.....	1 load
Catwalk skid.....	1 load
Pipe bin skid.....	1 load
Donut weight skids.....	1 load
Donut skid--stabilizer.....	1 load
Estimated minimum loads for basic drilling equipment.....	<u>15 loads</u>

Procedure

1. Arrange for overweight, overheight, and overlength road permits, and state highway patrol escort of the drill rigs as required.
2. Connect a heavy duty truck tractor equipped with a winch to the drill rig trailers, for towing from the Staging Facility to the emergency site.
3. Tow the drill rig trailers to the emergency site by the highway route which will permit the shortest overall travel time. Particular consideration must be given to low bridges or underpasses which may require rerouting.
4. Using a crane or rig-up tandem truck with gin poles, load derrick and the various skid mounted modules of drilling equipment and other equipment items on off-highway type trucks with trailers. The skid modules are numbered in the general sequence in which the loads for each rig are to be hauled from the Staging Facility.
5. Haul the drill rig trailers and other drilling equipment directly to the drill site if site preparation has been completed. If required to wait for completion of drill site preparation, unload the rig trailers and other equipment at a suitable marshaling area as near the drill site as possible, so the trucks can be released for other uses.
6. If the rigs and equipment are unloaded at a marshaling area, keep two trucks with trailers and 3 heavy duty tandem type rig-up trucks available for replacing derrick and moving the rigs and equipment to the drill site as required.

Movement by Cargo Aircraft

Description

For movement of equipment by airlift, the services of a number of C-130, L-100, or larger aircraft are required. Non-stop range of either aircraft is approximately 1,900 miles, fully loaded. Cargo capacities of these aircraft and other potential candidates are shown below:

Aircraft Airlift Capacities

<u>Aircraft</u>	<u>Height</u>	<u>Width</u>	<u>Length</u>	<u>Gross payload</u>
C-130...	105"	120"	41'	24,000 lbs.
L-100-10	105"	120"	37'	45,000 lbs.
L-100-20	105"	120"	46'	45,000 lbs.
L-100-30	105"	120"	56'	45,000 lbs.
C-141...	105.3"	120"	70'	70,847 lbs.
C-5A....	13'6"	19'	145'	180,000 lbs.

The C-130/L-100 aircraft are in service in relatively large numbers and will most likely be the aircraft available for emergency airlift. However, use of C-130/L-100 aircraft requires the greatest degree of disassembly of the equipment.

APPENDIX D.--OPERATIONS SUPPORT CENTER ALERT ACTIONS

Supervisor

Report to the Operations Support Center, assemble and supervise assigned personnel.

Establish contact with key personnel listed in the notification plan and ensure that all MEO support personnel have been notified of the alert.

Determine the name and location of the mine affected, the telephone number of the mine office, and the equipment and support services which the mine may provide.

Assess and recommend to the Westinghouse Deputy the mode and route of transportation to be used in the event that deployment of the MEO Equipment is ordered. Notify the Staging Facility of these plans.

Maintain the Operations Support Center Log, recording all important events and the times of their occurrence.

Maintain the Center's status boards.

Locate and alert sources of trucking, rail and/or aircraft services needed to transport the MEO personnel and equipment and obtain estimates of transportation response time and enroute time.

Obtain a report of current and forecast weather conditions in the emergency area and along the route of equipment movement.

Assemble appropriate State and county maps from the Center's files for use by support personnel.

Determine mode and route for transportation of support personnel to the emergency area.

Support Personnel

Report to the Operations Support Center.

Locate and alert sources for the following services:

Crawler tractors and operators needed for site preparation.

A registered surveyor in the mine emergency area.

The emergency area telephone company of possible requirements.

Portable electric generators and/or commercial electric power.

An explosives contractor.

Lodging, mess facilities, and personnel transportation in the emergency area.

Portable office trailers, sanitary facilities, and spectator control service in the emergency area.

Air compressors for the probe and rescue drill rigs.

A boring machine with an operator for possible use in anchoring drill rig guys.

A contract welder with portable equipment.

Water service for drill operations.

Diesel fuel service.

A mist pump.

Diesel mechanics, drilling supplies, and cementing services.

APPENDIX E.--MEMORANDUM OF UNDERSTANDING BETWEEN THE MINING ENFORCEMENT
AND SAFETY ADMINISTRATION, DEPARTMENT OF THE INTERIOR, AND THE
DEPARTMENT OF THE AIR FORCE

April 5, 1974

Mr. Frank A. Shrontz
Assistant Secretary of the Air Force
(Installations and Logistics)
The Pentagon
Washington, D. C. 20330

Dear Mr. Shrontz:

The Memorandum of Understanding transmitted with your letter of February 28, 1974, covering Air Force airlift in support of Mining Enforcement and Safety Administration efforts to rescue men trapped by mine emergencies, has been signed and a copy is enclosed for your files.

Also enclosed is a listing of personnel authorized to request assistance under this agreement. Positions are listed with present incumbents. It is our practice always to have a man acting in each position when the incumbent is absent from his office, so that you might be contacted by an acting official whose name is not listed. We utilize a contractor to handle logistics for MESA during mine emergencies. Our present contract is with the Westinghouse Electric Corporation, Defense and Electronics Center, Baltimore, Maryland. The contractor will determine the availability of commercial air transport and, as our agent, will be authorized to contact your staff directly during an emergency. MESA will always make the initial contact with you when an emergency occurs. We would like to arrange a meeting to brief you and your staff on our procedures and probable airlift requirements.

On behalf of MESA, I want to thank you and the Air Force for your cooperation and assistance in our efforts to reduce the human costs that have been associated with mining.

Sincerely yours,

(sgd.) James M. Day

Administrator

Enclosures 2

This Memorandum of Understanding is entered into the 5th day of April 1974, between the Mining Enforcement and Safety Administration, Department of the Interior (hereinafter referred to as MESA) and the Department of the Air Force (hereinafter referred to as the Air Force):

W I T N E S S E T H:

WHEREAS, sections 103(e) and (f) of the Federal Coal Mine Health and Safety Act of 1969 (30 U.S.C. 801) provide that an authorized representative of the Secretary of the Interior may, if he deems it appropriate, supervise and direct the rescue and recovery activity in a coal mine, and approve plans to recover any person in the mine or to recover or to return the mine to normal; and implied authority exists under the Federal Metal and Nonmetallic Mine Safety Act (30 U.S.C. 721) for the Secretary of the Interior to participate in rescue and recovery operations in metal and nonmetallic mines; and

WHEREAS, the Administrator, Mining Enforcement and Safety Administration, is authorized by 218 DM 1 and 218 DM 2 to exercise the authority of the Secretary of the Interior under the Federal Coal Mine Health and Safety Act of 1969 and the Federal Metal and Nonmetallic Mine Safety Act; and

WHEREAS, the Air Force has the airlift capability to provide the aforementioned assistance to MESA in connection with disasters occurring within the United States; and

WHEREAS, MESA desires to use and the Air Force agrees to provide airlift assistance to move MESA and other personnel, equipment and supplies to support rescue and recovery operations; and

WHEREAS, MESA is authorized to enter into this Memorandum of Understanding with the Air Force under section 103(c) of the Federal Coal Mine Health and Safety Act of 1969 and section 601 of the Economy Act of 1932, as amended (31 U.S.C. 686) and the annual provisions of the Interior Department Appropriation Act.

NOW, THEREFORE, MESA and Air Force agree as follows:

1. Airlift Assistance. Whenever a mine disaster occurs in a coal, metal or nonmetal mine within the United States which in the judgment of the Administrator, MESA, requires the immediate transportation of men, equipment and supplies to the site of the disaster, and when commercial aircraft is not available to meet the emergency needs of MESA, MESA may request and the Air Force shall provide in accordance with the terms hereof; provided, however that provision of such assistance does not seriously disrupt or adversely effect the accomplishment of the primary mission of the Air Force, airlift assistance in the movement of essential MESA and other personnel, equipment and supplies by available military aircraft in order to save lives and to prevent human suffering.

2. Emergency Operations. The Administrator, MESA, or his designees shall, after determining that commercial aircraft are not available to meet

the emergency needs of MESA, submit each request for airlift assistance by telephone and confirm each request in writing to Headquarters, Department of the Air Force, Deputy Chief of Staff, Systems & Logistics, Director of Transportation (AF/LGT), Washington, D.C. 20330. In providing such assistance Air Force commanders shall comply with applicable Air Force Directives.

MESA shall furnish Headquarters, Department of the Air Force, Deputy Chief of Staff, Systems & Logistics, Director of Transportation (AF/LGT), Washington D.C. 20330, with a current list of all designees of the Administrator authorized to request emergency airlift assistance.

All requests by MESA shall include: (1) a statement that commercial aircraft are not available within the emergency time frame; (2) The type and amount of assistance required; (3) the extent and probable duration of the emergency; and (4) an appropriate identifying number which shall be used by the Air Force to maintain an accurate record of all costs and expenses incurred in implementing each request by MESA for airlift assistance.

3. Payment. MESA shall reimburse the Air Force for actual costs incurred by the Air Force in rendering the requested airlift assistance. All costs with respect to the use of aircraft shall be in accordance with Air Force Manual 172-1, Volume I, and Air Force Manual 177-102, Part III, Chapter 5. Reimbursement for aircraft support will be based on flying hour factors contained in AFM 173-10. Military pay and allowances are excluded. Reimbursement for other services rendered will include only civilian overtime. Additionally, travel and per diem for military and civilian personnel shall be charged as provided in the Joint Travel Regulations and the Standardized Governmental Travel Regulations. Billing attributed to each request shall be submitted by the Air Force to MESA on Standard Form 1080.

4. Termination. Subject to Article 5 below, this Memorandum of Understanding shall continue in force and effect from the date written above, provided, however, that it may be terminated at any time by either party giving written notice of termination to the other party at least 30 days prior to the date fixed in such notice.

5. Appropriation by Congress. This Memorandum of Understanding, insofar as it extends beyond the current fiscal year (F.Y. 74), is contingent upon and subject to action by the Congress of the United States in appropriating and MESA making funds available for expenditures hereunder after such fiscal year shall have expired. In the absence of such fund availability this agreement shall terminate as a matter of law and MESA shall cease request for airlift assistance.

IN WITNESS WHEREOF, the parties hereto have made and executed this Memorandum of Understanding as of the day, month and year first written above.

Mining Enforcement and Safety
Administration
Department of the Interior

By /s/ James M. Day
Administrator

Department of the Air Force

By /s/ Frank Shrontz
Assistant Secretary of the
Air Force
(Installations and Logistics)

POINTS OF CONTACT FOR AIR FORCE AIRLIFT ASSISTANCE

<u>NAME</u>	<u>OFFICE</u>	<u>TELEPHONE</u>	<u>HOME</u>
Colonel R. J. Cowin	(202) 767-4129		(301) 248-4375
Lt Col J. F. McGovern	(202) 767-4129		(301) 248-3513
Mr. C. F. Pamepinto	(202) 767-4129		(301) 736-6522

PERSONNEL AUTHORIZED TO REQUEST AIRLIFT ASSISTANCE FROM THE AIR FORCE

Mining Enforcement and Safety Administration

<u>Position</u>	<u>Incumbent</u>	<u>Office Tel. No.</u>	<u>Home Tel. No.</u>
Administrator.....	James M. Day.....	(202)343-4763	(703)538-5997
Asst. Administrator--Metal and Nonmetal Mine Health and Safety.	Arthur P. Nelson.....	(202)343-6665	(703)820-0606
Deputy Asst. Adm.--MNMHS.....	Thomas J. Shepich.....	(202)343-6261	(703)471-7134
Supvy. Mining Engineer, Safety Division--MNMHS.	Roland V. Wilson.....	(202)343-6261	(703)437-5313
Asst. Administrator--Coal Mine Health and Safety.	John W. Crawford.....	(202)343-4249	(703)938-7920
Deputy Asst. Administrator--CMHS.....	Joseph L. Cook.....	(202)343-4976	(703)356-6527
Chief, Safety Division--CMHS.....	Herschel H. Potter.....	(202)343-6384	(703)527-2428
Asst. Administrator--Tech. Support.....	Donald P. Schlick.....	(703)557-1130	(703)538-4917
Deputy Asst. Adm.--Tech. Support.....	Robert G. Peluso.....	(703)557-1538	(703)538-4696
Chief, Pgh. Technical Support Ctr.....	E. J. Harris.....	(412)621-4500, Ext. 238	(412)327-2464
Chief, Mine Emergency Operations.....	D. C. Ward.....	(412)621-4500, Ext. 307	(412)531-3146

Westinghouse Electric Corporation--Defense and Electronics Center

J. A. Moore	(301)765-4833
W. E. Cook	"
J. S. Gibbens	"
J. G. Davis	"

APPENDIX F.--MEMORANDUM OF UNDERSTANDING BETWEEN THE NATIONAL PARK SERVICE
AND MINING ENFORCEMENT AND SAFETY ADMINISTRATION

May 21, 1974

Memorandum

To: Administrator--MESA

From: Assistant Administrator--Technical Support

Subject: Memorandum of Understanding

Enclosed for your signature is a Memorandum of Understanding between MESA and the National Park Service. This Memorandum basically will require our Mine Emergency Operation, Pittsburgh Technical Support Center, to respond in case of an emergency in caves operated by the NPS. A previous version involving Mammoth Cave had been reviewed and approved by the Solicitor's Office. This version applies to all caves operated by the National Park Service and has also been approved by the Solicitor's Office.

We recommend that you sign the Memorandum of Understanding to cover all caves operated by the National Park Service. After signing please return to this office for transmittal to the NPS.

/s/ Donald P. Schlick

Donald P. Schlick

This Memorandum of Understanding is made and entered into this 6th day of June, 1974, between the National Park Service, represented by its Director (hereinafter referred to as the Service), and the Mining Enforcement and Safety Administration represented by its Administrator (hereinafter referred to as MESA).

WHEREAS, the Service is responsible under various acts, laws, and treaties of the United States for administering and managing the lands, waters, and natural and historic resources contained within the boundaries of various Service areas (hereinafter referred to as "Parks") for the benefit and enjoyment of the people of the United States; and

WHEREAS, groups or individuals engaged in scientific studies, mapping, or exploration within the caves of the Parks may sustain injuries that would preclude their removal from the caves by litter evacuation through the cave passages; and

WHEREAS, MESA and MESA contractors and subcontractors possess specialized equipment, knowledge, and manpower to cope with the technical and logistical problems involved in drilling a vertical rescue shaft and in conducting small-scale blasting to enlarge existing small passages; and

WHEREAS, the Service and MESA recognize the need for advance planning to effectively deal with emergency situation which may require prompt and decisive action to save human life; and

WHEREAS, this Memorandum of Understanding is authorized under section 601 of the economy Act of 1932, as amended (31 U.S.C. 686) and the annual provisions of the Interior Department Appropriations Act.

NOW THEREFORE, the Service and MESA agree as follows:

A. The Service shall:

1. Consult with MESA on each rescue and recovery operation in which the use of drilling equipment or blasting is contemplated as a means of saving human life.
2. Reimburse MESA for all expenses and costs incurred which are related to the use of MESA and contractor personnel and equipment during rescue and recovery operations. Billing for each rescue and recovery operation shall be submitted by MESA to the Service on Standard Form 1080.
3. Approve the use of all drilling and blasting during rescue and recovery operations. All requests to MESA for manpower and equipment shall come from the Superintendent of the Park involved.
4. Develop the precise location and surface plotting of passage sections large enough for use as drilling target zones in areas of the caves where underground evacuation would be impractical. Such survey and

plotting work shall be undertaken by the same groups engaged in the exploration and scientific work in the caves whose members might eventually have need of the rescue techniques developed under this memorandum.

B. MESA shall:

1. Hold expenses and costs incurred during rescue and recovery operations to the minimum required to accomplish rescue and recovery and restore surface disturbances.
2. Prepare each drilling site and thereon locate, set up and operate drilling and related equipment and machinery, together with all supplies and materials as may be determined necessary to conduct drilling during rescue and recovery operations; and to excavate one or more ponds to receive dry or wet cuttings from drillings operations; and to cut and maintain access roads to and from the drilling sites.

C. The Service and MESA shall:

1. Cooperate in maintaining a current emergency call-out sheet which will be used to alert MESA personnel when a rescue and recovery operation arises.
2. Exchange information between Park staffs and MESA personnel on operational topics such as, the status and extent of poorly accessible cave passages, and changes and improvements in MESA rescue, drilling and blasting equipment or procedures.
3. Keep environmental disturbances of Park surfaces and underground features to an absolute minimum consistent with the effective use of blasting or drilling equipment during any rescue operation. All surface disturbances on and around drilling sites shall be restored as soon as practical after rescue and recovery operations.
4. No modification or amendment shall be made to this Memorandum of Understanding except as may be mutually agreed upon in writing by the Service and MESA.
5. This Memorandum of Understanding shall expire on June 30, 1976, but may be extended by written agreement between the parties hereto, provided however, that it may be terminated at any time by either party giving written notice of termination to the other party at least thirty (30) days prior to the date fixed in such notice.
6. This Memorandum of Understanding, insofar as it extends beyond the current fiscal year (FY '74), is contingent upon and subject to action by the Congress of the United States in appropriating and the Service and MESA making funds available for expenditures hereunder after such current fiscal year shall have expired.

IN WITNESS WHEREOF, the parties hereto have made and executed this Memorandum of Understanding as of the date first written above.

MINING ENFORCEMENT AND SAFETY
ADMINISTRATION

By: /s/ James M. Day

Title: Administrator

NATIONAL PARK SERVICE

By: /s/ Ronald H. Walker

Title: Director









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